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ПЕРЕКЛАД НАУКОВО-ТЕХНІЧНОЇ ЛІТЕРАТУРИ

Навчальний посібник-практикум. Для студентів освітнього ступеня «Бакалавр» спеціальності 275.02 «Транспортні технології (на залізничному транспорті)» усіх форм навчання (перший рік вивчення)

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Навчальний посібник-практикум із дисципліни «Переклад науково-технічної літератури» призначено для студентів освітнього ступеня «Бакалавр» спеціальності 275.02 «Транспортні технології (на залізничному транспорті)» вищих закладів освіти відповідає структурі та змісту Робочої програми «Переклад науково-технічної літератури» кафедри іноземних мов Державного економіко-технологічного університету транспорту, а також вимогам кредитно-модульної системи організації процесу освітньої діяльності у вищих закладах освіти. У посібнику-практикумі застосовано функціонально-прагматичний підхід до вивчення мовних явищ, які подаються у своєму автентичному функціонуванні у зв'язному висловлюванні (реченні чи тексті) й у зв'язках і взаємодії з усіма елементами мовної системи. Таке групування різнорівневих мовних явищ забезпечує студентам можливість простежити функціональні зв'язки між мовними одиницями різних рівнів і саме так підвести студентів до розуміння алгоритмів подолання лексико-граматичних труднощів перекладу та сприйняття семантичних та стильових аспектів перекладу. Посібник має логічну та продуману структуру. Також до посібника-практикуму включено вправи для тренування загальних академічних навичок, розроблені авторами завдання, які базуються на проблемному підході до їх формулювання та ураховують внутрішньо-предметні та між-предметні зв'язки. Ці вправи навчають студентів розуміти значення незнайомих слів на основі словотворчих елементів і контексту, самостійно виконувати лексико-граматичний аналіз при перекладі текстових уривків, застосовувати знання із технічних дисциплін як основу смислової і мовної здогадки.

Навчальний посібник розглянуто та рекомендовано до друку рішенням кафедри «Іноземні мови» ДЕТУТ (протокол № 4 від 30 листопада 2016 р.) та науково-методичної комісії факультету УЗТ ДЕТУТ (протокол № 5 від 26 грудня 2016 р.).

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ПЕРЕДМОВА

Навчальний посібник-практикум із дисципліни «Переклад науково-технічної літератури» призначено для студентів вищих закладів освіти ОС «Бакалавр» спеціальності 275.02 «Транспортні технології (на залізничному транспорті)», які вивчають зазначену дисципліну перший рік. Необхідність у підготовці такого навчального посібника-практикуму об'єктивно зумовлена актуальністю пошуку нових інтенсивних шляхів і засобів мовної освіти, яка, безперечно, потребує застосування сучасної науково-методичної концепції, а також відсутністю навчального посібника чи підручника, який би охоплював усі розділи Робочої програми «Переклад науково-технічної літератури» з урахуванням специфіки термінологічної системи та науково-технічного стилю мовлення, що використовуються у зазначеній галузі професійної діяльності. Навчальний посібник-практикум відповідає структурі та змісту Робочої програми дисципліни «Переклад науково-технічної літератури» кафедри іноземних мов Державного економіко-технологічного університету транспорту, а також вимогам кредитно-модульної системи організації процесу освітньої діяльності у вищих закладах освіти.

У навчальному посібнику-практикумі застосовано функціонально-прагматичний підхід до вивчення мовних явищ, які подаються у своєму автентичному функціонуванні у зв'язному висловлюванні й у зв'язках і взаємодії з усіма елементами мовної системи. Крім того, увесь навчальний матеріал, ретельно відібраний авторами з автентичних джерел, згруповано за практико-орієнтованим методом Case Study, який визнано у сучасній світовій дидактиці одним із найефективніших щодо активізації діяльності студента з опанування змістом освітньої програми. Таке групування різнорівневих мовних явищ забезпечує студентам можливість простежити функціональні зв'язки між мовними одиницями різних рівнів і саме так підвести студентів до розуміння алгоритмів подолання лексико-граматичних труднощів перекладу та сприйняття семантичних та стильових аспектів перекладу. Зазначений навчальний посібник-практикум є інтегрованою складовою навчально-

методичного комплекту з англійської мови і призначений для студентів, які перший рік вивчають дисципліну «Переклад науково-технічної літератури», що відображено відповідно у його лексико-термінологічному та граматико-стилістичному наповненні.

Посібник-практикум має логічну та ретельно продуману структуру. Його розподілено на два розділи (кожний розділ – *Unit* – охоплює навчальний матеріал, опанування якого передбачено протягом одного семестру). До кожного розділу посібника включено підрозділ (*Pre-Case Studying, Revision and Training*) для вивчення, повторення та тренування академічних навичок з формування та активізації граматичної компетенції за темами, визначеними авторами навчального посібника-практикуму відповідно до статистичної значущості труднощів перекладу; три підрозділи (*Case Study*), при опрацюванні яких відбувається формування, розвиток та активізація у студентів лексичної компетенції, вивчення студентами особливостей функціонування термінологічної системи відповідного «поля» професійної діяльності та набуття студентами практичного особистого досвіду у доборі засобів української мови для передачі іншомовної інформації та у її адекватному стилістичному оформленні; підрозділ (*Self-training assignments*) із завданнями для самостійного тренування із перекладу із української мови англійською; підрозділ (*Getting prepared for Credit-Test №* 1) із завданнями для складання заліку. Наприкінці навчального посібника-практикуму надано список літератури, рекомендований авторами студентам для самостійного опрацювання навчального матеріалу, та список використаних авторами джерел для підготовки даної навчально-методичної розробки.

Структурно *Unit 1* та *Unit 2* є подібними, оскільки кожний із них містить підрозділ *Pre-Case*, три *Case Study* підрозділи (*Case Study 01, 02, 03* у *Unit 1*та *Case Study 04, 05, 06* у *Unit 2*) із завданнями на перевірку рівня сформованості граматичної компетенції студентів за відповідними темами, підрозділ із завданнями для самостійної роботи студентів та із ключами до цих завдань, підрозділ із заліковими завданнями. Таким чином, розподіл усього навчального

матеріалу першого року вивчення дисципліни «Переклад науково-технічної літератури» та кількість балів, які студент може отримати за опрацьовану під час аудиторних занять чи самостійно частину матеріалу та за виконання залікових завдань, можна схематично представити у вигляді таблиці:

I семестр	Вид навчальної діяльності студента	Кількість балів
Unit 1. Pre-Case Studying, Revision and Training	Аудиторна та самостійна робота	0 – 20
Case Study 01		0 – 20
Case Study 02		0 – 20
Case Study 03		0 – 20
Self-training assignments	Самостійна робота	---
Getting prepared for Credit-Test № 1		---
Credit-Test № 1	Залік	0 – 20
Разом за I семестр		0 – 100
II семестр	Вид навчальної діяльності студента	Кількість балів
Unit 2. Pre-Case Studying, Revision and Training	Аудиторна та самостійна робота	0 – 20
Case Study 04		0 – 20
Case Study 05		0 – 20
Case Study 06		0 – 20
Self-training assignments	Самостійна робота	---
Getting prepared for Credit-Test № 2		---
Credit-Test № 2	Залік	0 – 20
Разом за II семестр		0 – 100

Варто зазначити, що до *Pre-Case* підрозділу *Unit 1* автори навчального посібника-практикуму включили для опрацювання граматичні теми *The Article*, *Word building*, *Words order*, *The Preposition*, *The Conjunction*, *The Verb*, *Passive voice* та *Modal Verbs* can, may, must *and their Equivalents*. У підрозділі подано стислі відомості за кожною із граматичних тем та акцентовано увагу студентів на певних специфічних аспектах вживання лінгвістичних явищ, які вивчаються за кожною із граматичних тем. Цей підрозділ містить також сімнадцять вправ-

завдань, які мають на меті перевірку рівня сформованості граматичної компетенції студентів за відповідними темами. Нумерація вправ-завдань є наскрізною, що, як свідчить наш викладацький досвід, дозволяє студентам легше і швидше орієнтуватися у матеріалах підрозділу.

Pre-Case підрозділ *Unit 2* навчального посібника-практикуму включає для опрацювання граматичні теми *Sequence of Tenses*, *The Participle*, *Absolute Participle Construction*, *The Gerund*. У підрозділі подано стислі відомості за кожною із граматичних тем та акцентовано увагу студентів на специфічних аспектах вживання лінгвістичних явищ, які вивчаються за кожною із граматичних тем. Цей підрозділ містить тридцять вправ-завдань, які мають на меті перевірку рівня сформованості граматичної компетенції студентів за відповідними темами. Нумерація вправ-завдань є наскрізною.

Після виконання завдань *Pre-Case* підрозділів кожний студент має виконати по три підрозділи *Case Study* за семестр. Підрозділ *Case Study 01* містить п'ятнадцять текстових уривків (відповідно до максимальної кількості студентів у академічній підгрупі), об'єднаних одною темою «З історії залізничного транспорту» (*From the history of transport*). Обсяг кожного навчального уривка – близько двох тисяч друкованих знаків. Аналогічно побудовані і решта підрозділів *Case Study*; відрізняються вони тематикою текстових уривків, об'єднаних у кожний окремий *Case Study*, а саме *Case Study 02* містить текстові уривки за темою «Залізниці у сучасному світі» (*Railroads in the modern world*), *Case Study 03* – за темою «Транспорт як галузь народного господарства» (*Transport as a branch of economy*).

Case Study підрозділи, що виконуються студентом у II семестрі, також містять по п'ятнадцять текстових уривків кожний, та об'єднані за такими темами: *Case Study 04* – «Колія та колійне господарство» (*Track and track facilities*), *Case Study 05* – «Залізничні цивільні споруди» (*Railway civil engineering*), *Case Study 06* – «Забезпечення роботи залізниці» (*Railway operation providing*). Обсяг кожного навчального уривка – близько двох тисяч друкованих знаків.

Опрацювання кожного із *Case Study* полягає у тому, що студент отримує за узгодженням із викладачем один із текстових уривків підрозділу і повинен виконати п’ятнадцять завдань до цього підрозділу.

Виконуючи завдання 1-7 (спрямовані на застосування студентом власної сформованої граматичної компетенції), студент аналізує структуру кожного речення у текстовому уривку та:

1) виписує із текстового уривка усі підмети, визначає засоби їх вираження, на основі аналізу виписаних підметів класифікує засоби вираження підмета в англійському реченні та подає виконане завдання викладачеві для зарахування;

2) виписує із текстового уривка усі присудки, визначає засоби їх вираження, на основі аналізу виписаних присудків класифікує засоби вираження присудка в англійському реченні та подає виконане завдання викладачеві для зарахування;

3) виписує із текстового уривка усі додатки, визначає засоби їх вираження, класифікує засоби вираження додатка в англійському реченні та подає виконане завдання викладачеві для зарахування;

4) виписує із текстового уривка усі означення, визначає засоби їх вираження, класифікує засоби вираження означення в англійському реченні та подає виконане завдання викладачеві для зарахування;

5) виписує із текстового уривка усі обставини, визначає засоби їх вираження, класифікує засоби вираження обставини в англійському реченні та подає виконане завдання викладачеві для зарахування;

6) виписує із текстового уривка усі модальні дієслова та модальні звороти/еквіваленти, пояснює їхні значення і способи передачі модальності англійського дієслова засобами української мови та подає виконане завдання викладачеві для зарахування;

7) виписує із текстового уривка усі граматичні конструкції, які не мають українських відповідників, пояснює способи перекладу таких конструкцій

засобами української мови та подає виконане завдання викладачеві для зарахування.

Завдання 8-11 вимагають від студента активізації лексичної компетенції та застосування знань особливостей термінологічної системи поля майбутньої професійної діяльності. Студент аналізує структуру кожного речення того ж самого текстового уривку та:

8) виписує із текстового уривка усі скорочення, подає їхні повні відповідники, порівнює переклад скорочень і повних словосполучень, а також виписує із тестового уривка повні словосполучення, які мають загальноприйняті скорочення та подає виконане завдання на перевірку викладачеві;

9) виписує із текстового уривка усі інтернаціоналізми, подає їхні українські відповідники, виписує із тестового уривка українські слова, які мають загальновживані інтернаціональні «замінники», та подає виконане завдання на перевірку викладачеві;

10) виписує із текстового уривка усі «несправжні друзі перекладача», наводить їхні правильні значення, пояснює, де можливо, відмінності у значеннях розглянутих слів та правила добору відповідника при перекладі і подає виконане завдання на перевірку викладачеві;

11) виписує із текстового уривка усі слова, ужиті у переносному значенні, подає основне значення цього слова, пояснює логіку використання слова у переносному значенні та подає виконане завдання на перевірку викладачеві.

Завдання 12 вимагає від студента перекласти детально опрацьований текстовий уривок із використанням у разі необхідності класичних академічних словників та/або наявних у його розпорядженні сучасних електронних словників (Multitran, Prompt etc.). У завданні 13 необхідно скласти план текстового уривка. Після цього студент укладає словничок до тексту (vocabulary) та тлумачний термінологічний словник до текстового уривка, який аналізується (завдання 14 та 15). Виконані завдання подаються викладачеві на перевірку і зарахування.

Підрозділ *Self-training assignments* першого розділу містить сім завдань на переклад з української мови англійською у вигляді тестів множинного вибору відповіді та ключі до кожного із завдань. Аналогічний підрозділ другого розділу містить уже десять завдань на переклад з української мови англійською у вигляді тестів множинного вибору відповіді та ключі до кожного із них. Усі завдання спрямовані на те, щоб забезпечити ефективність самостійної роботи студента щодо опанування змісту навчальної дисципліни.

Підрозділи *Getting prepared for Credit-Test № 1* та *№ 2* навчального посібника-практикуму фактично містять усі десять текстових уривків, переклад яких англійською мовою (усно, без допоміжних матеріалів) і складає зміст контрольного заходу у формі заліку, що передбачено Робочою програмою дисципліни «Переклад науково-технічної літератури». Текстові уривки для перекладу на залік у першому семестрі мають загальний обсяг 10 255 др. зн. (від 912 др. зн. до 1099 др. зн.). Загальний обсяг залікових матеріалів другого семестру – 11 508 др. зн. (від 1100 др. зн. до 1232 др. зн.).

UNIT 1. PRE-CASE STUDYING, REVISION AND TRAINING

THE ARTICLE

Неозначений артикль **a (an)**	*Означений артикль* **the**	*Без артикля*
Необчислювальні іменники у однині, згадані уперше: *I have a house. The house is in the country*.	Океани, моря, річки; озера та гори у множині: *the Red Sea, the Atlantic Ocean, the Alps, the Andes* (крім озер у однині та гірських вершин *Lake Baikal, Mount Vesuvius*)	Іменники у множині та необчислювальні іменники при узагальненні: *Milk is good for kids.* (Але: *The milk is in the fridge.*)
Представники народу, країни: *a French woman* *a Japanese worker*	Явища або поняття, єдині у своєму роді: *the earth, the Queen, the sun, the Moon*	Абстрактні іменники: *freedom, happiness*
Деякі вирази кількості: *a few, twice a week, a pair of shoes, a little, forty miles an hour, a hundred*	Країни, назва яких складається з більш ніж одного слова та частини світу: *the United States, the East* (Але: *Great Britain*)	Країни, назва яких складається з одного слова, континенти: *China, Europe, Asia*
Опис людей, предметів, місць: *She has a nice face.*	Порядкові числівники: *the third chapter* *the First World War*	Кількісні числівники після іменників: *World War One, Chapter three*
Професія, представник або предмет даного класу: *He is a manager.* *This is a table*.	Театри, музеї, газети та готелі: *the Franko Theatre, the Mezhyhiria, the Times, the Hilton*	Вирази з видами транспорту та міста: *at home, in/to bed, at/to work, at/to school, by bus, by train, on foot*
	Певна група, клас людей, сім’я: *the unemployed, the Petrenkos*	Види спорту, пори року, науки: *soccer, autumn, physics*
		Планети, сузір’я: *Venus, Mars, Milky Way*

Exercise 1. Fill in *a/an* or *the* if required

1. Amanda is ... student. When she finishes her ... studies, she wants to be ... journalist. She lives with ... two friends in ... flat near ... college where she is studying. ... flat is small but she likes it. 2. It's ... nice morning. Let's go for ... walk. 3. What is ... largest city in ... Canada? 4. I like ... this room but I don't like ... colour of ... carpet. 5. Can you recommend ... good restaurant? 6. We had dinner in ... most expensive restaurant in ... town. 7. Excuse me, please. Can you tell me how to get to ... airport? 8. I'm going away ... next week. 9. Could you close ... door, please? 10. I've got ... problem. Can you help me? 11. I'm just going to ... post-office. I won't be long. 12. There were no ... chairs, so we had to sit on ... floor. 13. ... my sister has just got ... job in ... bank in ... Manchester. 14. Where did you have ... lunch? 15. Rita is studying ... English and ... Maths this term. 16. Please give me ... cup of ... coffee with ... cream and ... sugar. 17. ... Lake Erie is one of ... five Great Lakes in ... North America. 18. We crossed ... Atlantic Ocean. 19. What did you eat for ... breakfast this morning? 20. Last night ... bird was singing outside my house. 21. ... chair you are sitting in is broken. 22. Did you have ... nice holiday? – Yes, it was ... best holiday I've ever had.

Exercise 2. Choose the right word

1. Where's *milk/the milk*? It's in the fridge. 2. I don't like *milk/the milk*. I never drink it. 3. We went for a swim in the river. *Water/the water* was very cold. 4. I don't like swimming in *cold water/the cold water*. 5. Excuse me, can you pass *salt/the salt*, please? 6. I like this town. I like *people/the people* here. 7. *Vegetables/The vegetables* are good for you. 8. I can't sing this song. I don't know *words/the words*. 9. I enjoy taking *photographs/the photographs*. It's my hobby. 10. He's afraid of *dogs/the dogs*. 11. *Women/the women* live longer than *men/the men*. 12. We had a very nice meal. *Vegetables/The vegetables* were especially good. 13. I like *skiing/the skiing* but I'm not very good at it. 14. Why are *people/the people* violent?

Exercise 3. Insert articles where necessary

1. … science of mechanics studies forces in bodies at rest and … working forces in bodies in motion. 2. … civil engineers use information from … statics – how bodies

behave at rest – to prevent disastrous movement in stable structures, such as … bridges and … buildings. 3. Aeronautical engineers use … principle of … dynamics – how … bodies behave in motion – to design … airplanes and … rockets. 4. One of … mechanical principles important to both those studies is … center of gravity. 5. All the weight of … solid body is centered at one point. 6 … term "engineering" is used in many specialties, it has many meanings. 7. This branch of industry appeared 30 years ago; very soon it achieved … prominent position. 8. Mechanical engineering is one of … most important branches of engineering. 9. … physical changes are sometimes accompanied by … chemical changes. 10. Among … names of … early inventors of steam engines we should mention … name of Cherepanov.

Exercise 4. Insert articles where necessary

1. … second law gives a valuable means for …measuring forces. 2. Any change in motion of … body is in proportion to … force pressing on it. 3. "Principia" was later on called … greatest product of … single human race. 4. At … age of 12 Newton was sent to school, seven miles away from … his home to continue his education. 5. On … Earth's surface, however, it is difficult to demonstrate fully … first law of motion. Insert articles where necessary. 6. Roentgen called … rays which emerged from … glass tube X-rays because at first he didn't understand what caused them. 7. … fact that those rays were able to penetrate different objects stronger than … cathode rays astonished Roentgen very much. 8. It was evident for Roentgen's contemporaries that ... discovery would have … great future. 9. … question was where these strange rays were emerging from. 10. … object of his investigation was in what way it was possible to use … new rays in … medicine and … industry.

Exercise 5. Insert articles where necessary

1. … strong bonds are broken when … water is formed from … hydrogen and … oxygen. 2. … same kinds of … chemical reactions that occur in … inorganic chemistry also occur in … organic chemistry. 3. … valence concept is … guide for scientists who tried to find some … regularities in … properties of elements. 4. It was D.I. Mendeleyev, … prominent scientist, who formulated … Periodic Law – periodic dependence of … properties of … elements upon their atomic weights. 5. … special

relativity required … modification of … laws of … mechanics. 6. Einstein derived … equivalence of rest mass MO and … energy F. 7. … sponsors recommended for … Einstein's membership in … Prussian Academy of Science. 8. … general relativity postulates that … uniform acceleration and … gravitational field are equivalent. 9. … general theory of relativity made extensive use of Ricc-Curbastro's tensor calculus. 10. From 1911 Einstein realized … importance of … astronomical observations to … his theories.

WORD BUILDING

Суфіксальний спосіб творення різних частин мови

Основні суфікси:

Іменника	-er/-or, -ist, -ant/-ent, -ian, -man, -ess, -ness, -tion, -ion, -ation, -ment, -ism, -dom, -hood, -ty, -ship, -age, -ance/-ence, -ing, -ce
Прикметника	-ful, -less, -ic, -al, -ish, -ous, -able, -en, -like, -ary/-ory, -ive, -ly, -y, -ent, -ive
Дієслова	-by, -en, -ize, -ate
Числівника	-th, -teen, -ty

WORDS ORDER

За своєю будовою речення поділяються на прості і складні. Просте речення може бути поширеним і непоширеним. Складні речення поділяються на складносурядні та складнопідрядні. Кожне речення складається із головних (підмета, присудка) та другорядних (додатків, обставини часу, місця, способу дії) членів. До складу складних речень входять два або більше простих речень, які відповідно до залежності між собою утворюють складносурядні або складнопідрядні речення.

У сучасній англійській мові, де система відмінкових закінчень розвинута мало, показником синтаксичної функції слова є його місце в реченні.

Порядок слів простого речення

I Підмет	**II Присудок**	**III Додаток**			**IV Обставина**		
		непрямий без прийменника	прямий	непрямий з прийменником	способу дії	місця	часу
She	teaches	me	English			at home	every week
I	sent	Nick	a letter				
I	sent		a letter	to him			
Nick	got		a letter	from me			
We	read		this book		with great pleasure		

Залежно від мети висловлювання речення поділяються на розповідні, питальні, наказові й окличні. У розповідних реченнях дотримується прямий порядок слів і за своєю організацією вони не становлять особливих труднощів. Щодо питальних речень, то завдяки деяким структурним відмінностям від української мови, вони потребують ретельного вивчення. Тому ми зупинимося на п’яти типах питальних речень (interrogative sentences) або питань (questions): загальних, спеціальних, альтернативних, до підмета та роз’єднувальних.

Загальні питання (вимагають відповіді „Так чи Ні”).

Структура питання:	***Допоміжне або модальне дієслово***	***Підмет***	***Основне (смислове) дієслово***	***Інші члени реч.***
Для дієслова в:				
to be в Present/Past Simple	***Am, are, is, was, were***	I, you, we, they, he, she, it	***----------***	_____?
Present Simple	***Do, does***	I, you, we, they, he, she, it	***V***	_____?
Past Simple	***Did***	I, you, we, they, he, she, it	***V***	_____?
Present Continuous	***Am, are, is***	I, you, we, they, he, she, it	***V + ing***	_____?
Past Continuous	***Was, were***	I, you, we, they, he, she, it	***V + ing***	_____?
Present Perfect	***Have, has***	I, you, we, they, he, she, it	***V3***	_____?
Past Perfect	***Had***	I, you, we, they, he, she, it	***V3***	_____?
Present Perfect Continuous	***Have, has***	I, you, we, they, he, she, it	***been V + ing***	_____?
Past Perfect Continuous	***Had***	I, you, we, they, he, she, it	***been V + ing***	_____?
Future Simple	***Shall, will***	I, you, we, they, he, she, it	***V***	_____?
Future Continuous	***Shall, will***	I, you, we, they, he, she, it	***be V + ing***	_____?
Future Perfect	***Shall, will***	I, you, we, they, he, she, it	***have V3***	_____?
Future Perfect	***Shall, will***	I, you, we, they, he, she, it	***have been V + ing***	_____?

Continuous				
Присудки з модальними дієсловома	***Can, may, must, should, would***	I, you, we, they, he, she, it	***V***	_____?

Альтернативні питання (передбачають вибір із двох речей, осіб, дій, явищ та ін.; базуються на структурі загального питання)

Допоміжне або модальне дієслово	***Підмет***	***Основне дієслово***	***Інші члени речення***
Did	my friends ***or your friends***	*buy*	two new magazines?
Did	my friends	*buy* ***or sell***	two new magazines?
Did	my friends	*buy*	two new magazines ***or newspapers*** ?
Did	my friends	*buy*	two new ***or old*** magazines?
Did	my friends	*buy*	two ***or three*** new magazines?

Спеціальні питання (починаються питальними словами what? which? (що? який?), where? (де? куди?), when? (коли?), whose? (чий? чия? чиє?), how much? how many? (скільки) та ін.; базуються на структурі загального питання)

Питальне слово	***Допоміжне або модальне дієслово***	***Підмет***	***Основне дієслово***	***Інші члени речення***
When	*did*	my friends	*buy*	two new magazines?
How many new magazines	*did*	my friends	*buy*	yesterday?
Which magazines	*did*	my friends	*buy*	yesterday?
What	*did*	my friends	*buy*	yesterday?

Питання до підмета (починаються питальними словами who? what? (хто? що?); у питаннях до підмета зберігається прямий порядок членів речення)

Питальне слово Who? What?	***Допоміжне або модальне дієслово***	***Основне дієслово***	***Інші члени речення***
Who	----	*bought*	two new magazines yesterday?
Who	----	*lives*	in a town?
Who	----	*are*	you?
What	----	*is*	it?
Who	*is*	*singing*	so loudly?
Who	*has*	*read*	this text?
Who	*will*	*come*	soon?
Who	*can*	*speak*	English?

Роз'єднувальні питання (мають дві частини – перша, стверджувальна або заперечна, з прямим порядком слів, а друга – коротке заперечне загальне питання, якщо перша частина – стверджувальна, і навпаки, коротке стверджувальне загальне питання, якщо перша частина – заперечна; друга

частина завжди містить займенник, відповідний підметові, і перекладається українською мовою ***чи (хіба) не так?***)

	Перша частина (твердження)	Друга частина (заперечення)
приклади	Yesterday my friends bought two new magazines,	***didn't they?***
	My parents live in a town,	***don't they?***
	His brother has brought a pencil,	***hasn't he?***
	There were many people in the street,	***weren't there?***
	Перша частина (заперечення)	Друга частина (твердження)
приклади	Yesterday my friends didn't buy two new magazines,	***did they?***
	My parents don't live in a town,	***do they?***
	His brother hasn't brought a pencil,	***has he?***
	You have never been to Paris,	***have you?***

THE PREPOSITION

Прийменник – це службове слово, яке виражає відношення одного члена речення до іншого. Прийменники передають відношення іменника, займенника, числівника або герундія до дієслова або до іншого іменника. На відміну від української мови, де є шість відмінків іменника, в англійській мові їх лише два: загальний (the Common Case) і присвійний (the Possessive Case). Загальний відмінок не має спеціальних відмінкових закінчень. Зв'язок іменника в загальному відмінку з іншими словами виражається прийменниками, а також місцем, яке іменник займає в реченні.

В українській мові			В англійській мові		
Н.	хто? що?	товариш	Загальний відмінок	нема прийменника, місце перед присудком	friend
Р.	кого? чого?	товариша		**of** + noun	of friend
Д.	кому? чому?	товаришеві		**to** + noun; **for** + noun	to friend
З.	кого? що?	товариша		нема прийменника, місце після присудка	friend
О.	ким? чим?	товаришем		**by** + noun; **with** + noun	by friend
М.	про кого? про що?	про товариша		**about** + noun; **of** + noun	about friend

Розрізняють також прийменники місця (*in, on, by, at, under* та ін.), руху (*to, from, into, across*), часу (*at, on, in, for* та ін.).

THE CONJUNCTION

Сполучник – це службове слово, яке вживається для з'єднання членів речення і речень. За формою сполучники поділяються на прості (*and, but, after, when, till* та ін.), складні (*until, however, unless* та ін.) і складені (*as well as, as long as, as if* та ін.). За граматичними функціями сполучники поділяються на сурядні, які сполучають однорідні слова або з'єднують незалежні прості речення: *I bought a newspaper and a magazine; We met them and they told us their news*, і підрядні, які з'єднують підрядне речення з головним: *They went to the town where they were born; He will come as soon as you tell him.*

THE VERB

Дієслово – частина мови, яка означає дію або стан. Дієслова бувають прості (*to do, to speak* та ін.), похідні, тобто утворені за допомогою суфіксів і префіксів (*to dislike, to widen*), і складні, які утворюють одне значення двома словами (*to come in, to go on* та ін.). Особові форми дієслова виражають особу, число, час, стан, спосіб дії і виступають у реченні лише у функції присудка: *My sister lives in Zhytomyr*. Неособові форми дієслова – інфінітив (the infinitive), герундій (the gerund) і дієприкметник (the participle) – не мають звичайних форм особи, числа, способу і не можуть бути присудком, хоча і бувають у його складі: *To be or not to be ... (інфінітив); I am fond of reading (герундій); A man standing by the window ... (дієприкметник); A broken glass (дієприкметник).*

Спосіб дієслова

Спосіб дієслова показує, як мовець розглядає дію відносно дійсності. В англійській мові є три способи:

1. Дійсний спосіб показує, що дія розглядається як реальний факт у теперішньому, минулому і майбутньому: *Peter speaks English. Peter spoke English. Peter will speak English.*

2. Наказовий спосіб висловлює спонукання до дії, тобто наказ, прохання, пораду та ін. Наказовий спосіб має форму другої особи: *Come in! Give me your book.*

3. Умовний спосіб показує, що мовець розглядає дію не як реальний факт, а як щось допустиме чи бажане: *If I were you, I would not go there.*

Стан дієслова

В англійській мові є два стани дієслова: активний (***the active voice***) і пасивний (***the passive voice***). Коли підмет є особою чи предметом, що виконує дію, дієслово вживається у формі активного стану: *I asked him.* Коли підмет є особою чи предметом, що підлягає дії з боку іншої особи чи предмета, дієслово вживається у формі пасивного стану: *I was asked.*

PASSIVE VOICE

Пасивний стан вживається тоді, коли в центрі уваги співрозмовника є особа або предмет, на які спрямована дія. Особа, яка виконує дію, при цьому здебільшого не вказується. У тих випадках, коли необхідно вказати особу, яка виконує дію, або знаряддя дії, або матеріал, з якого зроблено предмет, використовуються прийменники by, with, of:

Her letter was written ***with*** a pencil.	Її лист був написаний олівцем.
This play was written ***by*** Franko, the great Ukrainian writer.	Ця п'єса була написана Франком, видатним українським письменником.
Many modern buildings are made ***of*** steel and glass.	Багато сучасних споруд будують зі сталі та скла.

Усі часові форми пасивного стану в англійській мові утворюються з відповідних часів допоміжного дієслова ***to be*** та дієприкметника минулого часу (Participle II) основного дієслова.

ЧАСИ АНГЛІЙСЬКОГО ДІЄСЛОВА

Англійці, так само як і українці, при осмисленні та передачі інформації про події реальності виділяють три часові плани: *Present – теперішній; Past – минулий; Future – майбутній.* Але на відміну від української дієслівної системи, англійська виділяє ще чотири аспектно-часові групи, кожна з яких розглядає дію з точки зору характеру її протікання і має три часових плани (Present, Past, Future). Таким чином, в українській дієслівній системі існує тільки *три* часові форми активного стану для вираження реальних дій, у той час, як в англійській

дієслівній системі нараховується *дванадцять* часових форм (4 групи по 3 часових плани в кожній), що вживаються з тією ж метою: **чотири** часові форми **Present** – *Present Simple, Present Continuous, Present Perfect, Present Perfect Continuous;* **чотири** часові форми **Past** – *Past Simple, Past Continuous, Past Perfect, Past Perfect Continuous;* **чотири** часові форми **Future** – *Future Simple, Future Continuous, Future Perfect, Future Perfect Continuous,* що можна проілюструвати таблицею:

		Чотири аспектно-часові групи			
		Simple (Indefinite) прості часи	Continuous тривалі часи	Perfect перфектні, завершені часи	Perfect Continuous перфектно-тривалі часи
		Назва часової форми в англійській мові			
Три часових плани	Present	***Present Simple***	***Present Continuous***	***Present Perfect***	***Present Perfect Continuous***
	Past	***Past Simple***	***Past Continuous***	***Past Perfect***	***Past Perfect Continuous***
	Future	***Future Simple***	***Future Continuous***	***Future Perfect***	***Future Perfect Continuous***

THE PRESENT SIMPLE TENSE

Форми дієслова в **Present Simple** утворюються:

Форма						
стверджувальна		**заперечна**		**питальна**		
в Активному стані (Active voice)						
I, you	*V*	I, you	***do not*** *V*	***Do***	I, you	*V*?
He, she, it	*V* + s	He, she, it	***does not*** *V*	***Does***	he, she, it	*V*?
We, they	*V*	We, they	***do not*** *V*	***Do***	we, they	*V*?
в Пасивному стані (Passive voice)						
I	***am*** *V3*	I	***am not*** *V3*	***Am***	I	*V3?*
You, we, they	***are*** *V3*	You, we, they	***are not*** *V3*	***Are***	You, we, they	*V3?*
He, she, it	***is*** *V3*	He, she, it	***is not*** *V3*	***Is***	He, she, it	*V3?*

Дієслово **to be** *бути* в Present Simple відмінюється не за загальним правилом, до того ж, це дієслово не має форм пасивного стану (як і інші «статальні» дієслова):

Форма						
стверджувальна		**заперечна**		**питальна**		
I	***am***	I	***am not***	***Am***	I	?
You, we, they	***are***	You, we, they	***are not***	***Are***	you, we, they	?
He, she, it	***is***	He, she, it	***is not***	***Is***	he, she, it	?

Present Simple вживається:

1) для вираження повторюваної, регулярної, звичної дії:

Every month James *writes* articles about new investment opportunities. — Кожного місяця Джеймс *пише* статті про нові інвестиційні можливості.

2) для вираження низки послідовних подій (інструкції, спортивні коментарі, авторські ремарки в сценаріях і п'єсах);

3) для вираження дії або стану, які відбуваються незалежно від волі людини:

Sugar *dissolves* in water. — Цукор *розчиняється* у воді.

4) для вираження майбутньої дії в підрядних реченнях часу та умов і, які вводяться сполучниками **when** *коли;* **after** *після того* як; **before** *перш ніж, перед тим як;* **till, until** *поки;* **as soon as** як *тільки;* **if** *якщо;* **unless** *якщо не* та ін.:

If I *have* free time we shall go for a walk. — Якщо *матиму* час, ми підемо на прогулянку.

5) для вираження майбутньої дії згідно з програмою або з розкладом (здебільшого з дієсловами, що означають рух: **to go** *іти, їхати;* **to come** *приходити, прибувати:* **to leave** *від'їжджати;* **to start** *вирушати;* **to arrive** *прибувати* та ін.). У відповідних українських реченнях вживається теперішній час.

THE PRESENT CONTINUOUS TENSE

Форми дієслова в **Present Continuous** утворюються:

Форма						
стверджувальна		**заперечна**		**питальна**		
в Активному стані (Active voice)						
I	***am*** *V+ing*	I	***am not*** *V+ing*	***Am***	I	*V+ing?*
You, we, they	***are*** *V+ing*	You, we, they	***are not*** *V+ing*	***Are***	you, we, they	*V+ing?*
He, she, it	***is*** *V+ing*	He, she, it	***is not*** *V+ing*	***Is***	he, she, it	*V+ing?*
в Пасивному стані (Passive voice)						
I	***am being*** *V3*	I	***am not being*** *V3*	***Am***	I	***being*** *V3?*
You, we, they	***are being*** *V3*	You, we, they	***are not being*** *V3*	***Are***	you, we, they	***being*** *V3?*
He, she, it	***is being*** *V3*	He, she, it	***is not being*** *V3*	***Is***	he, she, it	***being*** *V3?*

Present Continuous вживається:

1) для вираження дії, що відбувається в момент мовлення:

He *is talking* to a customer on the phone now. — Він зараз *розмовляє* з клієнтом по телефону.

2) для вираження тривалої дії, що відбувається в певний період теперішнього часу, хоч і не обов'язково в момент мовлення:

He *is studying* at the university. — Він *навчається* в університеті.

3) для вираження запланованої майбутньої дії, що стосується особистих планів людей:

I'm seeing the accountants on Friday. Я *зустрічаюсь* з бухгалтерами у п'ятницю.

4) для вираження запланованої майбутньої дії з дієсловами руху ***go, come, arrive, leave, start, begin*** і т.ін.:

The expedition *is arriving* in a week. Експедиція *прибуде* через тиждень.

THE PRESENT PERFECT TENSE

Форми дієслова в **Present Perfect** утворюються:

Форма						
стверджувальна		**заперечна**		**питальна**		
в Активному стані (Active voice)						
I, you, we, they	***have*** *V3*	I, you, we, they	***have not*** *V3*	***Have***	I, you, we,they	*V3 ?*
He, she, it	***has*** *V3*	He, she, it	***has not*** *V3*	***Has***	he, she, it	*V3 ?*
в Пасивному стані (Passive voice)						
стверджувальна		**заперечна**		**питальна**		
I, you, we, they	***have been*** *V3*	I, you, we, they	***have not been*** *V3*	***Have***	I, you, we,they	***been*** *V3 ?*
He, she, it	***has been*** *V3*	He, she, it	***has not been*** *V3*	***Has***	he, she, it	***been*** *V3 ?*

Present Perfect вживається:

1) для вираження дії, яка відбулась до моменту мовлення, і той, хто говорить, має на увазі результат цієї минулої дії, її важливість на момент мовлення:

I *have given* your report to him. Я віддав твій звіт йому. *(звіт зараз у нього).*

2) у реченнях з обставинами часу:

а) що означають період часу, який почався в минулому і тривав до моменту мовлення: **up to now**, **up to the present** *до цього часу;* **lately** *нещодавно, за останній час;* **recently** *останнім часом;* **so far** *до цього часу;* **since** *відтоді;* **not yet** *ще не;*

б) що означають період часу, який ще не закінчився: **today** *сьогодні,* **this week** *цього тижня,* **this month** *цього місяця,* **this year** *цього року,* **this morning** *сьогодні вранці* та ін.;

в) Present Perfect вживається також у реченнях з прислівниками неозначеного часу і частотності: **ever** *коли-небудь,* **never** *ніколи,* **often** *часто,* **seldom** *рідко,* **already** *вже,* **just** *щойно;*

3) для вираження дії або стану, що триває з якогось моменту в минулому аж до моменту мовлення, переважно з дієсловами, що не мають форми Continuous. Період тривалості дії здебільшого позначається прийменником **for (for an hour** *протягом години,* **for ten years** *протягом десяти років,* **for a long time** *довгий час* і т.п.*),* а початок дії - словом **since (since five o'clock з** *п'ятої години,* **since Monday** з *понеділка,* **since I saw him** *з того часу, як я його бачив* і т. п.).

THE PRESENT PERFECT CONTINUOUS TENSE

Форми дієслова в **Present Perfect Continuous** утворюються (цієї аспектно-часової форми не має серед форм пасивного стану в англійській мові):

Форма						
стверджувальна		**заперечна**		**питальна**		
в Активному стані (Active voice)						
I, you, we, they	***have been*** *V+ing*	I, you, we, they	***have not been*** *V+ing*	***Have***	I, you, we, they	***been*** *V+ing?*
He, she, it	***has been*** *V+ing*	He, she, it	***has not been*** *V+ing*	***Has***	he, she, it	***been*** *V+ing?*

Present Perfect Continuous вживається:

1) для вираження тривалої дії, що почалася в минулому і відбувається в момент мовлення:

He *has been watching* TV since 5 o'clock. Він *дивиться* телевізор з п'ятої години.
I *have been having* driving lessons for 6 months. Я *беру* уроки водійства шість місяців.

2) для вираження тривалої дії, що почалася в минулому, тривала деякий час і закінчилася безпосередньо на момент мовлення:

He is out of breath. He *has been running* fast. Він захекався. Він швидко *біг*.

Present Perfect Continuous не має аналогів в українській мові і може перекладатися формою як теперішнього, так і минулого часу.

THE PAST SIMPLE TENSE

Форми дієслова в **Past Simple** утворюються:

Форма						
стверджувальна		**заперечна**		**питальна**		
в Активному стані (Active voice)						
I, you, he, she, it, we, they	*V2*	I, you, he, she, it, we, they	***did not*** *V*	***Did***	I, you, he, she, it, we, they	*V*?
в Пасивному стані (Passive voice)						
I, he, she, it	***was*** *V3*	I, he, she, it	***was not*** *V3*	***Was***	I, he, she, it	*V3?*
You, we, they	***were*** *V3*	You, we, they	***were not*** *V3*	***Were***	you, we, they	*V3?*

Дієслово **to be** *бути* в Past Simple відмінюється не за загальним правилом, до того ж це дієслово не має форм пасивного стану (як і інші «статальні» дієслова):

Форма						
стверджувальна		**заперечна**		**питальна**		
I, he, she, it	***was***	I, he, she, it	***was not***	***Was***	I, he, she, it	?
You, we, they	***were***	You, we, they	***were not***	***Were***	you, we, they	?

Past Simple вживається:

1) для вираження одноразової або постійної дії в минулому. Час минулої дії уточнюється обставинними словами **yesterday** *учора*; **last week** *минулого тижня*; **last year** *торік*, **last summer** *минулого літа*, **the other day** *недавно* та ін.:

20 years ago few people *realized* computers were to become part of our lives. — 20 років тому мало людей *розуміли*, що комп'ютери мають стати частиною нашого життя.

2) для вираження ряду послідовних дій чи повторюваної дії у минулому;

3) Дієслова, що не мають аспектно-часової форми Past Continuous, вживаються в цьому значенні в формі Past Simple.

THE PAST CONTINUOUS TENSE

Форми дієслова в **Past Continuous** утворюються:

Форма						
стверджувальна		**заперечна**		**питальна**		
в Активному стані (Active voice)						
I, he, she, it	***was*** *V+ing*	I, he, she, it	***was not*** *V+ing*	***Was***	I, he, she, it	*V+ing?*
You, we, they	***were*** *V+ing*	You, we, they	***were not*** *V+ing*	***Were***	you, we, they	*V+ing?*
в Пасивному стані (Passive voice)						
I, he, she, it	***was being*** *V3*	I, he, she, it	***was not being*** *V3*	***Was***	I, he, she, it	***being*** *V3?*
You, we, they	***were being*** *V3*	You, we, they	***were not being*** *V3*	***Were***	you, we, they	***being*** *V3?*

Past Continuous вживається:

1) для вираження дії, що відбувалась, тривала в певний момент у минулому. На час дії вказують також обставинні слова типу **at two o'clock**, **at midnight**, **at that moment**, **at 5 o'clock**, або підрядні речення з дієсловом-присудком у Past Simple:

He *was working* at his English at that time. — Він *працював* над англійською в той час.

2) для вираження дії, що тривала протягом якогось періоду часу в минулому і не пов'язана з певним моментом ні в минулому, ні в теперішньому часі (підкреслюється *процес* дії).

THE PAST PERFECT TENSE

Форми дієслова в **Past Perfect** утворюються:

Форма						
стверджувальна		**заперечна**		**питальна**		
в Активному стані (Active voice)						
I, you, he, she, it, we, they	***had*** *V3*	I, you, he, she, it, we, they	***had not*** *V3*	***Had***	I, you, he, she, it, we, they	*V3?*
в Пасивному стані (Passive voice)						
I, you, he, she, it, we, they	***had been*** *V3*	I, you, he, she, it, we, they	***had not been*** *V3*	***Had***	I, you, he, she, it, we, they	***been*** *V3?*

Past Perfect вживається:

1) для вираження дії, що відбулася раніше іншої дії, позначеної дієсловом у Past Simple:

They *had* already *gone* when I arrived. Вони вже *пішли*, коли я прибув.

2) часто у складнопідрядному реченні із сполучниками **after** *після того як* і **before** *перед там як, перш ніж;*

3) для вираження минулої дії, що вже закінчилася до певного моменту в минулому. Цей момент позначається словосполученнями: **by two o'clock** *до другої години,* **by that time** *до того часу,* **by the 1st of September** *до першого вересня*, тощо:

I *had done* my homework by eight o'clock. До 8-ої години я *виконав* домашнє завдання.

THE PAST PERFECT CONTINUOUS TENSE

Форми дієслова в **Past Perfect Continuous** утворюються (цієї аспектно-часової форми не має серед форм пасивного стану в англійській мові):

Форма						
стверджувальна		**заперечна**		**питальна**		
в Активному стані (Active voice)						
I, you, he, she, it, we, they	***had been*** *V+ing*	I, you, he, she, it, we, they	***had not been*** *V+ing*	***Had***	I, you, he, she, it, we, they	***been*** *V+ing?*

Past Perfect Continuous вживається:

1) для вираження тривалої дії, яка почалася до якогось моменту в минулому і або продовжувалася в цей момент, або закінчилася безпосередньо перед ним:

I explained that I *had been looking for* it for the last two hours. Я пояснив, що я вже протягом двох годин *шукаю* його.

2) З дієсловами, що не мають форми Continuous, замість Past Perfect Continuous вживається Past Perfect.

THE FUTURE SIMPLE TENSE

Стверджувальна, питальна та заперечна форми дієслова в **Future Simple** утворюються:

Форма						
стверджувальна		**заперечна**		**питальна**		
в Активному стані (Active voice)						
I, we	***shall*** *V*	I, we	***shall not*** *V*	***Shall***	I, we	*V*?
You, he, she, it, they	***will*** *V*	You, he, she, it, they	***will not*** *V*	***Will***	You, he, she, it, they	*V*?
в Пасивному стані (Passive voice)						
I, we	***shall be*** *V3*	I, we	***shall not be*** *V3*	***Shall***	I, we	***be*** *V3*?
You, he, she, it, they	***will be*** *V3*	You, he, she, it, they	***will not be*** *V3*	***Will***	You, he, she, it, they	***be*** *V3*?

Future Simple вживається:

1) для вираження одноразової дії в майбутньому, для констатації майбутнього факту:

I'*ll go* over with you tomorrow morning. *Я поїду* з тобою завтра вранці.

2) для вираження постійної, звичної або повторюваної, регулярної дії в майбутньому;

3) для вираження послідовності дій в майбутньому:

You'*ll go* to the station, *will buy* the ticket and *will get on* the suburban train to Fastyv. Ти *поїдеш* на вокзал, *купиш* квиток та *сядеш* на приміський поїзд на Фастів.

THE FUTURE CONTINUOUS TENSE

Форми дієслова в **Future Continuous** утворюються (цієї аспектно-часової форми не має серед форм пасивного стану в англійській мові):

Форма						
стверджувальна		**заперечна**		**питальна**		
в Активному стані (Active voice)						
I, we	***shall be*** *V+ing*	I, we	***shall not be*** *V+ing*	***Shall***	I, we	***be*** *V+ing?*
You, he, she, it, they	***will be*** *V+ing*	You, he, she, it, they	***will not be*** *V+ing*	***Will***	you, he, she, it, they	***be*** *V+ing?*

Future Continuous вживається:

1) для вираження тривалої дії, що відбуватиметься в якийсь момент або період часу в майбутньому:

Meet me at 2 o'clock. I'*ll be looking out* for you. Зустрінемось о 2 годині. *Я чекатиму* на тебе.

2) для вираження не тривалої, але заздалегідь спланованої дії:

I'*ll be meeting* them at the station. *Я зустріну* їх на станції.

3) у підрядних реченнях часу й умови жодна з форм майбутнього часу в англійській мові не вживається. Для вираження майбутньої дії в таких реченнях вживається Present Continuous or Simple.

THE FUTURE PERFECT TENSE

Форми дієслова в **Future Perfect** утворюються:

Форма						
стверджувальна		**заперечна**		**питальна**		
в Активному стані (Active voice)						
I, we	***shall have V3***	I, we	***shall have not V3***	***Shall***	I, we	***have V3 ?***
You, he, she, it, they	***will have V3***	You, he, she, it, they	***will have not V3***	***Will***	you, he, she, it, they	***have V3 ?***
в Пасивному стані (Passive voice)						
I, we	***shall have been V3***	I, we	***shall have not been V3***	***Shall***	I, we	***have been V3 ?***
You, he, she, it, they	***will have been V3***	You, he, she, it, they	***will have not been V3***	***Will***	you, he, she, it, they	***have been V3 ?***

Future Perfect вживається:

1) для вираження майбутньої дії, що закінчиться до певного моменту або до початку іншої дії в майбутньому. Цей момент може фіксуватися обставиною часу з прийменником ***by*** або іншою дією, що виражається дієсловом у часовій формі ***Present Simple***:

You'*ll have forgotten* me *by* then. До того часу ви мене *забудете*.

2) для вираження майбутньої дії в підрядних реченнях часу та умови замість Future Perfect вживається Present Perfect.

We'll get a flat when they *have built* the house. Ми одержимо квартиру, коли *збудують* дім.

THE FUTURE PERFECT CONTINUOUS TENSE

Стверджувальна, питальна та заперечна форми дієслова в **Future Perfect Continuous** утворюються (цієї аспектно-часової форми не має серед форм пасивного стану в англійській мові):

Форма						
стверджувальна		**заперечна**		**питальна**		
в Активному стані (Active voice)						
I, we	***shall have been V+ing***	I, we	***shall have not been V+ing***	***Shall***	I, we	***have been V+ing?***
you, he, she, it, they	***will have been V+ing***	you, he, she, it, they	***will have not been V+ing***	***Will***	you, he, she, it, they	***have been V+ing?***

Future Perfect Continuous вживається:

для вираження майбутньої дії, яка почнеться до певного моменту і яка на конкретно визначений момент у майбутньому відбуватиметься вже деякий час (тобто на конкретно визначений момент у майбутньому вже буде наявним певний проміжний результат). Цей момент може фіксуватися обставиною часу з прийменником ***by*** або іншою дією, що виражається дієсловом у часовій формі ***Present Simple***:

The 9 of April they *will have been married* for eleven years.	9 квітня *буде* одинадцять років, як вони *одружені*.

Ця часова форма вживається в сучасній англійській мові досить рідко.

Exercise 6. Compare the two sentences in the Active and Passive Voice

1. The first railways used horses for drawing trains. – Horses were used on the first railways for drawing trains. 2. The Cherepanovs constructed the first steam locomotive in Russia. – The first Russian locomotive was constructed in the Urals. 3. George Stephenson demonstrated his locomotive in 1829. – Now this locomotive is demonstrated in a London museum. 4. Many changes will take place on railways in the future. – Many changes will be made on railways in the future. 5. He told them an interesting story. – They were told an interesting story.

Exercise 7. Translate paying attention to the Passive constructions

1. This book is often asked for. 2. At lunch nothing was discussed but the latest news. 3. Weather cannot be controlled by people. 4. Stamps are placed in the upper right-hand corner of an envelope. 5. His speech was much spoken about.

Exercise 8. Change the sentences from Active into Passive

1. We use a generator to produce energy. – A generator … 2. He will do this work tomorrow. – This work … 3. Many delegations visited this museum. – This museum … 4. People sometimes call computers ‘electronic brains’. – Computers … 5. They will finish the restoration of the building in two years. – The restoration ….

Exercise 9. Translate the following sentences paying attention to the Passive Voice

1. The laboratory was given new equipment. 2. The scientist was asked to give his point of view on this hypothesis. 3. During examination the students are not allowed

to consult grammar books. 4. He was not offered any help. 5. We have been given all the necessary information. 6. The institute was promised financial support. 7. The speaker was asked a lot of questions. 8. The teachers are recommended to give passage as a talk. 9. If the mixture is allowed to stay overnight, it gradually decomposes. 10. Chemical methods of purifying water are extensively being used at present. 11. This atmospheric interference has often been referred to. 12. Recently this problem has been considered. 13. The fact that these substances slowly attack gold has already been mentioned. 14. In the course of further scientific development modern computing machines will be extensively used.

Exercise 10. Put the verbs in brackets into the Passive Voice. Translate the sentences

1. Far more money (spend) … on food now than ten years ago. 2. Last night we (invite) … to the restaurant by our friends from Spain 3. The book (discuss) … at the next conference. 4. The article (publish) … last week, if I'm not mistaken. 5. Much research (do) … to prevent our rivers and lakes from being polluted. 6. These subjects (to teach) in many higher educational establishments. 7. I think that this building (to build) in the 1970s. 8. Do you know when the new terminal (to open)? 9. Be quiet, please. My favourite show (to broadcast). 10. Do you know the news? The date of the meeting (to change)!

Exercise 11. Change active sentences into passive ones

Model: The teacher asked him a question. – *He was asked a question.*

1. They built some new houses in our street last year. 2. The agent must inform the buyers on the arrival of the ship. 3. She left money at home. 4. I take these books from the library. 5. They robbed the bank last week. 6. They equipped the laboratory with the latest computers. 7. Scientists make wonderful discoveries. 8. A railway line will connect the village with the town. 9. Who wrote this article? 10. A famous architect designed this theatre. 11. The director signed the contract last week. 12. Almost half of mankind speaks Chinese. 13. We have carried out a few experiments this week. 14. We have recently undertaken a new study. 15. They have recently made an analysis of the data. 16. They have accomplished an interesting

investigation this year. 17. We have lately published some useful information on this problem. 18. We have just presented a few illustrative recommendations. 19. They have ignored this important fact. 20. Postgraduate students have held a scientific conference this month.

Exercise 12. Choose the required voice form of the predicates (Active or Passive)

1) A new device [*has tested; has been tested*] in the lab. 2) The dining car was crowded but we [*served; were served*] rather fast. 3) A taxi [*called; was called*] 15 minutes ago; so we [*are expecting; are being expected*] it any moment. 4) At the corner of the street we [*saw; were seen*] a car. The locomotive driver [*was examining; was being examined*] the engine. 5) The road is closed because the road-works [*are conducting; are being conducted*]. 6) Powerful track-laying machines [*have developed; have been developed*] for the building of railroads. 7) The European Bank for Reconstruction and Development [*has made; has been made*] a loan of $US 120 to the Russian Ministry of Railways for the railway rehabilitation project. 8) David thought that his father [*had repaired; had been repaired*] his bicycle. 9) A new railway underground line [*is constructing; is being constructed*] in our city. One of the Metro stations [*will build; will be built*] near my house. 10) He [*broke; was broken*] my watch. 11) The manager [*has offered; has been offered*] me several jobs. 12) I [*will give; will be given*] a leave in July if there is no urgent work. 13) It was noisy. Nobody [*was listening; was being listened*] to him. 14) Bill [*kept; was kept*] his word and arrived exactly at the time he [*had promised; had been promised*]. 15) You can't watch the film now; the TV set [*is fixing; is being fixed*] by the mechanic.

MODAL VERBS *CAN, MAY, MUST* AND THEIR EQUIVALENTS

Модальні дієслова *can, may, must* передають не дію, а відношення до цієї дії (можливість, бажаність, необхідність та ін.). Після модального дієслова іде інфінітив без частки *to*. У заперечних та питальних реченнях модальні дієслова виконують функцію допоміжних дієслів.

Present	Past	Future
Необхідність – Змушеність – Обов'язок ***must – have to – be to – should – ought to***		
*I **must** meet him.* – Я повинен его зустріти (*категоричне зобов'язання, я так вважаю*). *I **have to** meet him.* – Я повинен его зустріти (*мені доводиться, необхідність виконання дії за певних обставин*). *We **are to** meet at 6.* – Ми маємо зустрітися о шостій годині (*повинність згідно з планом, розкладом, домовленістю*). *You **should (ought to)** meet him.* – Ти повинен (*тобі треба, слід*) його зустріти (*порада, рекомендація*).	*I **had to** meet him.* – Я повинен був (*мені довелося*) его зустріти. *I **was to** meet him.* – Я повинен був (*так передбачалось, було домовлено*) його зустріти.	*I **will have to** meet him.* – Я повинен буду його зустріти.
Здатність – Здібность – Можливість ***can – be able to***		
*He **can** swim.* – Він може плавати. *He **is able to** help you.* – Він має змогу тобі допомогти.	*He **could** swim.* *He **was able to** help you.*	*He **will be able to** help you.*
Дозвіл – Можливість (Вірогідність) ***may – be allowed to***		
*You **may** take it.* – Ви можете (вам дозволено) це взяти. *I **am allowed to** use the device.* – Я маю дозвіл використати цей прилад.	*I **might** use the device.* *I **was allowed to** leave.*	*I **will be allowed to** use this device.*

Exercise 13. Match the meaning of modal verbs and their and their equivalents

1. It may or may not be the case.	
2. You must not criticize your ideas.	
3. You do not have to accept this viewpoint.	**не потрібно**
4. The fact cannot be denied.	**не бути повинним**
5. The instrument should not be relied upon.	**не обов'язково**
6. The calculation would not agree with the theory.	**не слід**
7. There must not be a mistake in the calculation.	**не бажано**
8. The car inspector can't hear a word.	**не можна**
9. I can't think how our team could have made such a mistake.	**не дозволено**
10. It must not be true, I am sure.	**неможливо**
11. The crew can't know everything about it.	**не може бути**
12. The driver can not have been mistaken.	**ніяк не**
12. You need not come yourselves.	**не захотіти**
13. Our partners can not have been mistaken.	
14. The train could not have arrived at the station by nine.	
15. The headmaster was not to visit them.	

Exercise 14. Translate the sentences with different functions of the verb *be*

1. Some trains are to make stops at all railway stations. 2. The experimental tracks are laid without ballast. 3. The train is to run a high-speed service between big cities. 4. Electrified railways are to be found in different countries of the world. 5. The track structure is supported by ballast. 6. This high-speed line is to be put into operation in a month. 7. The radial metro lines in Moscow are connected by a circle line. 8. The future metro lines are to connect the city's centre with its suburbs. 9. My goal is to describe the mechanism in operation. 10. We are to complete the construction by the end of the month.

Exercise 15. Match two sentences to make mini dialogues. Pay attention to the modal verbs and their equivalents

1) The car in front of him stopped so	a) The plane was to take off at 5 a.m. and

suddenly that he was not able to brake and smashed into it.	in this hurry-scurry she left the ticket on the table.
2) I am to return my library books today but I have no spare time at all.	b) You should ring her up and apologize.
3) I haven't paid my monthly rent yet. Friday is the last day I can do it, but I am to leave for Donetsk today. Can you help me?	c) He can speak English rather fluently, but that time he was so embarrassed that he was not able to say a word.
4) I'm afraid I was rude to Kate yesterday.	d) You should record the film. Have you got a VCR?
5) I have got an urgent work and my computer doesn't work.	e) I'm sorry but I was not able to start my car and had to go by tram.
6) I have to prepare for a test but there is a film on TV I've wanted to see so much.	f) You should phone Nick. He has got clever fingers. I am sure he will be able to help.
7) Why are you so late? You should be punctual.	g) You are to return the books today or you will have to pay a fine.
8) Can he speak English? He was dumb as a fish the whole evening.	h) You needn't worry. I shall be able to go to the bank tomorrow and pay it.
9) Why did she have to come back home?	i) I can't believe it! He is such a careful driver.

Exercise 16. Choose the correct variant

1) Я можу зустріти тебя на вокзалі.

I _____ meet you at the terminal.

a) shall be allowed to b) can c) shall be able to d) have to

2) Поїзд повинен був прибути о 17 годині, але затримався через ремонт колії.

The train _____ arrive at 5 p.m. but it detained because of track repair work.

a) must b) had to c) was able to d) was to

3) Тобі доведеться зробити пересадку у Києві, тому, що не має прямого поїзда до Варшави.

You _____ change trains in Kyiv because there is no direct train to Warsaw.

a) will have to b) can c) needn't d) will be able to

4) До 19-го століття люди могли вільно пересуватись з однієї країни до іншої без паспортів.

Until the 19th century people _____travel freely between countries without passports.

a) are allowed to b) were to c) were able to d) should

5) Зараз пасажири можуть користуватись Інтернетом у вагоні, але за певну платню.

Now passengers_____ use the INTERNET in the carriage but for some fee.

a) are to b) need c) are allowed to d) could

6) Поїзд не міг залишити станцію, тому що лінія була зайнята.

The train _____ depart from the station, as the line was busy.

a) couldn't b) is not allowed to c) wasn't to d) were not able to

7) Тобі слід навчитись водити локомотив .

You _____ learn driving a locomotive.

a) needn't b) are to c) will be allowed to d) should

8) Завтра можеш не приходити.

You _____ come tomorrow.

a) mustn't b) are not allowed to c) needn't d) were not able to

9) Їм довелося поїхати вчора тому, що не було білетів на сьогоднішній поїзд.

They _____ leave yesterday because there were no tickets available for today's train.

a) were able to b) had to c) could d) must

10) Ти можеш підвезти мене до найближчої станції метро?

_____ you give me a lift to the nearest Metro station?

a) should b) need c) can d) could

Exercise 17. Translate the sentences into English

1. Ви можете зустріти його на нашій фірмі. 2. Їм потрібно допомогти майстру. 3. Студентам було дозволено користуватися підручниками. 4. Вам потрібно поговорити з ними стосовно відпустки. 5. Тобі треба написати листи нашим бізнес-партнерам. 6. Я міг це зробити сам. 7. Наша бригада зможе допомогти

вам розвантажити ці прилади тобі завтра. 8. Можна увійти? 9. Чому їм довелося покинути цю будівлю? 10. Він не зможе поїхати в Італію наступного місяця. 11. Вам доведеться зробити цю роботу до понеділка. 12. Я не зможу прочитати цю книгу за тиждень. 13. Вона повинна перекласти цю статтю до середи. 14. Я не можу відповісти на ваше питання. 15. Ти не можеш сьогодні піти у читальний зал. 16. Тобі слід поговорити з його керівництвом. 17. Я зможу їх побачити завтра. 18. Він повинен буде зробити доповідь на конференцію. 19. Йому доводиться зараз плідно працювати.

CASE STUDY 01
FROM THE HISTORY OF RAILWAY TRANSPORT

Do the following assignments to text abstract determined by your language supervisor as that for you to be analyzed individually

1. Write out of the text abstract all the Subjects. Analyze them and classify the means to express the Subject in English language.
2. Write out of the text abstract all the Predicates. Analyze them and classify the means to express the Predicate in English language.
3. Write out of the text abstract all the Objects. Analyze them and classify the means to express the Object in English language.
4. Write out of the text abstract all the Attributes. Analyze them and classify the means to express the Attribute in English language.
5. Write out of the text abstract all the Adverbial Modifiers. Analyze them and classify the means to express the Adverbial Modifier in English language.
6. Write out of the text abstract all the modal verbs. Explain their meanings and the ways to express English verb modality by means of Ukrainian language.
7. Write out of the text abstract all the Grammar structures having no Ukrainian equivalents. Explain the ways to translate such structures by means of Ukrainian language.
8. Write out of the text abstract all the abbreviations; give their non-contracted equivalents, compare the translations of the abbreviations to their non-contracted equivalents. Analyze the text abstract on the availability of non-contracted word combinations having generally-used abbreviations.
9. Write out of the text abstract all the international lexis; give their Ukrainian equivalents. Analyze the text abstract on the availability of Ukrainian words having generally-used international equivalents.
10. Write out of the text abstract all the “false friends of a translator”; give their proper meanings. Explain where it is possible the differences or peculiarities in the

meanings of the analyzed words. Explain the rules of choosing the proper lexical unit while translating.

11. Write out of the text abstract all the words used in their figural meaning; give their direct meaning. Explain the reasons of their using in a figural meaning.

12. Translate the following text abstract using available academic or electronic dictionaries (Multitran, Prompt etc.).

13. Make a plan of the text abstract.

14. Compile a vocabulary to the read and translated text abstract.

15. Compile a glossary of terms with their explanation in English to the analyzed text abstract.

DEVELOPMENT OF INLAND TRANSPORT

By the 1600's, most people used horse-drawn wagons to haul goods locally. But they seldom used wagons for long hauls because of the poor condition of the roads. Until the mid-1800's horse-drawn boats and barges were the chief means of long-distance inland transport. The animals trudged along the banks of rivers and canals and pulled the vessels with ropes. Hundreds of canals were built in Europe from the late Middle Ages through the early 1800's. The first major American canal, the Erie Canal, opened in New York in 1825. It connected Albany and Buffalo and provided a vital link in an all-water route between New York City and Great Lakes ports. Before the Erie Canal opened, the overland journey between Albany and Buffalo took about 20 days. The canal enabled horse-drawn barges to make the trip in 8 days. The success of the Erie Canal led to a great burst of canal building in the United States. By 1850, the United States had about 4,500 miles (7,240 kilometers) of canals. Canals, rivers, and other waterways carried most of the nation's intercity freight.

During the 1700's, France and England constructed the first well-built paved roads since Roman times. By the mid-1800's, the first major United States highway, the National Road, had been completed. The highway connected Cumberland, Md., and Vandalia. It was a gravel road and inferior to the best French and English roads of the time. American pioneers traveling west from the Mississippi River crossed a

wilderness without roads. They drove their covered wagons along well-traveled dirt paths, such as the Santa Fe Trail and the Oregon Trail.

The basic design of wagons and coaches changed little from the late Middle Ages through the 1800's. The first city coach line started in Paris during the 1660's. It was the ancestor of today's mass transit systems. The first long intercity coach line began service between England and Scotland about 1670. The line operated between the cities of London and Edinburgh, a distance of 392 miles (631 kilometers). The coaches were called stagecoaches because they traveled in stages, stopping at scheduled places on a route for changes of horses. The first stagecoach lines in the American Colonies began service during the 1730's.

EARLY RAILROAD DEVELOPMENT

The railroad as it is known today originated in England in the first quarter of the 19th century. Much earlier, however, crude "wagonways" were used in mines both in England and on the European continent. Mining railroads seemed to be introduced into England from Germany early in the 17th century. They were used also in Wales and Scotland. By the of end of the 18th century there was a considerable network of these mining railroads to connect mining pits and river, horses supplying the motive power. Two methods of guiding the vehicles along the track were used. Earliest practice was supposed to use vehicles with special flanged wheels, such as are used today. Later, "plateways" were introduced, iron angles laid end to end: the vertical flanges on these angles served to guide wagons, which had ordinary flat-treated wheels. The development of mechanical traction to replace horsepower may be said to mark the emergence of the modern railroad. Thereafter, railroad spread rapidly in Britain and then in other parts of the world. But, because of differing conditions, railroads developed quite differently in Britain, on the continent of Europe, and in North America.

In Britain the history of railroad industry starts with the "New Castle", a locomotive built by the English engineer Richard Trevithick. It ran on a Welsh tram-road in 1804, but, like a number of the early steam locomotives, was too heavy for the rails. The first practical and successful locomotive was built in 1812 to the

instructions of John Blenkinsop, an inspector at the Middleton colliery near Leeds. It ran on cast-iron rails and had two vertical cylinders driving two shafts geared to a toothed wheel that engaged a rack rail. In 1813 the English inventor William Hedley built the "Puffing Billy", a simple adhesion locomotive that relied on friction between the wheels and the rails, dispensing with the toothed rack rail (the rack-rail system is now used only on a few mountain railroads with extremely steep gradients). Like John Blenkinsop's locomotives, "Puffing Billy" was used for hauling coal wagons between a mine and wharves, as was George Stephenson's first locomotive, the "Blucher", completed in 1814.

THE START OF LOCOMOTIVE POWER

The invention of the steam engine marked the beginning of the greatest revolution in transportation since the invention of the wheel and the sailboat. British inventors developed the steam engine during the 1700's. In 1807, the first commercially successful steamboat service started in the United States. By the late 1800's, ships powered by steam engines were rapidly taking the place of sailing ships on the world's shipping lanes. The world's first successful steam railroad went into service in England in 1825. Steam-powered trains played the leading role in the transportation revolution. By the end of the eighteenth century, steam engines were widely used to drive machinery in factories, and to power lifts and pump water in mines. But they were enormous, bulky, awkward things. They generally had to be contained in a building erected round them. As long as they depended on using steam at only a few pounds pressure, working against a vacuum produced in a condenser, it was impossible to design an engine small enough to move about under its own power and haul a useful load as well. So although James Watt is generally known as the father of the stationary steam engine, it was Richard Trevithick, the apostle of "strong steam" and the use of pressures as high (by 1805) as 25 pounds per square inch or more, who was the originator of the locomotive.

The first railway locomotive was built by Trevithick in South Wales in 1804, as an experimental modification of one of his high-pressure stationary engines. It ran for long enough to prove the feasibility of the idea, but it was soon taken off its wheels

and used in a foundry. Trevithick's second operating locomotive ran for a while on a circular demonstration track in London during 1808, and started much public interest; but the first successful commercial use of locomotives was not until 1812, on the Middleton Railway near Leeds. By the late 1800's, steam locomotives traveled at speeds of up to 60 mph (97 kph) and faster. They could haul loads hundreds of times heavier than a team of horses could pull. By 1900, rail lines had been built throughout Europe and in many parts of the world. The overland journey by train from New York City to San Francisco took less than a week. In comparison, the trip took weeks or months by stagecoach or by covered wagon.

GEORGE STEPHENSON – RAILROAD PIONEER

In 1823 Stephenson, one of the great pioneer railroad and locomotive builders, was invited to build and equip a railroad from Stockton to Darlington. The ceremonial opening of this landmark line took place on September 27, 1825. The Stockton and Darlington Railway was the first public railroad in the world to use locomotive traction and the first built to carry both freight and passengers. At first steam locomotives were used only for freight services; passenger service was provided by a contractor who used horse-drawn coaches. The first locomotive on the Stockton and Darlington was George Stephenson's "Locomotion". It and similar locomotives proved unreliable and expensive to maintain. They were suitable only for hauling low-speed mineral trains; their weight and tractive effort were limited by the relatively weak track. At times the railroad reverted to horses, but the situation was improved in 1827 with the introduction of the "Royal George", a six-coupled locomotive designed by Timothy Hackworth.

But the railroad era really began with the opening, on September 15, 1830, of the Liverpool and Manchester Railway. The Liverpool and Manchester incorporated all the features of modern public railroads. It was a public carrier of both passengers and freight, with all business handled directly by the company itself. It used mechanical traction for all traffic. Previous to its opening in 1829, the Liverpool and Manchester held a contest to determine the best type of motive power. The trials took place on the Rainhill level (Lancashire) from October 6 to 14, 1829. Three steam

locomotives took part: George Stephenson's "Rocket", Timothy Hackworth's "Sans Pareil", and the "Novelty", built by John Braithwaite and John Ericsson. On the last day of the trials the "Rocket" was awarded the £ 500 prize.

The "Rocket's" superiority was due mainly to its use of a multiple fire-tube boiler rather than the single-flue boilers previously used. About this time, too, John Birkinshaw developed the fish-bellied (bellying out on the underside), rolled-iron edge rail. This was much stronger that the cast-iron rails previously used and enabled heavier locomotives to be run.

THE FIRST RAILWAYS IN EUROPE

The experiments with steam locomotion in England did not go unnoticed on the Continent, although given Britain's head-and-shoulders start in world industrialization it was several years before much development took place elsewhere.

The first public steam-worked railway in France was the Lyon & St Etienne, a 38-mile line opened in 1828 which took delivery of its first two engines the following year. They were built by Marc Seguin, a French engineer who had visited England and learnt a great deal from Stephenson's practice. His design solved a number of the problems, which had been vexing the Stockton & Darlington, without producing answers as satisfactory as Stephenson came to for the Liverpool & Manchester. Consequently the second and subsequent early French railways, such as the Paris-St. Germain (1837) and the two competing lines from Paris to Versailles (1839/40), obtained their earliest locomotives from the Stephenson works at Newcastle, it was some time before native products displaced the imports, partly because so many of the early Continental railways were also built by English engineers. Thus George Stephenson went to Spain, and Robert to Norway, to lay out their first main lines, and Joseph Locke was responsible, in the mid-1840s, for the main line from Paris to Le Havre.

Similarly with the first public steam railway in Germany, the short line from Nuremberg to Furth. opened in 1835. This commenced with a Patentee 2-2-2 named Der Adler imported complete with English driver. British machines and men also

pioneered railways in Spain, Italy, Switzerland, Austria, Belgium, Holland, Sweden, Russia, and elsewhere.

The importance of this still remains. The Stephenson gauge of 4ft 8 1/2 in is the European standard, and the European railways still use the same height and spacing of buffers and couplings as the English originals. But in Europe the tasks of railway building was taken by the State itself, and the Continental engineers were given much greater leeway in developing and expanding trains and clearances.

FIRST RAILROADS IN THE USA

Interest in railroads in the United States developed almost as soon as in England. One of several horse-drawn tramways built early in the 19th century was Gridley Bryant's Granite railway in Quince, Massachusetts. This three-mile broad-gauge line carried the granite used in building the Bunker Hill Monument in Boston.

By 1813 the inventor Oliver Evans was proposing a railroad between New York and Philadelphia. Two years later, John Stevens received from the New Jersey legislature the first charter for a railroad ever granted in America. Stevens was ahead of his time: the chartered line, between the Delaware and Raritan rivers, was never built. But in 1825 he built and operated the first locomotive to run on rails in America; it ran on a half-mile circle of track at Steven's home in Hoboken, New Jersey. Success of the Stockton and Darlington in England spurred interest in railroads in the United States. On February 28, 1827, the Baltimore and Ohio Railroad Company was chartered. The line began carrying revenue traffic on January 7, 1830. The first 13 miles of line, from Baltimore to Ellicott's Mills opened on May 24, 1830. The Baltimore and Ohio was the first railroad in the United States to be chartered as a common carrier of freight and passengers. Its promoters, looking beyond local needs, envisaged a line going all the way to the Ohio River to channel the commerce of the growing Middle West through the port of Baltimore. By 1834 the Baltimore and Ohio had built to Harpers Ferry, Virginia, and on December 24, 1852, it reached the Ohio River at Wheeling. Subsequently, the company expanded, both by new construction and by acquiring other railroads, until it reached Chicago, St. Louis, and the Great Lakes. With few exceptions, early railroads were designed to

promote the commercial interests of local communities or areas. As growth progressed, however, many of the small roads were consolidated, forming through routes that served fairly large territories, and new railroad projects became more ambitious. The Pennsylvania Railroad Company (now Perm Central) completed its line from Philadelphia to Pittsburgh in December 1852, using ten inclined planes to climb over the Allegheny Mountains. A little more than a year later, it completed an all-rail route.

START OF RAILROADING IN THE NEW WORLD

The essential difference between the geographies of Europe and of North America by 1830 was that while in Europe civilization had existed for centuries, and has established a complex structure of towns, buildings, land ownership, property rights, and other rights-of-way including turnpike roads and canals, through which the railways had to thread themselves, in America a nearly virgin landscape was still being or had only recently been wrested from the red man and most of the land had no individual owners at all. Turnpike roads and canals had begun to be built, but broad and long the railways could go where they wished without much consideration for other occupiers of the land, since there were none.

Tracks were laid down the main streets of towns – though often enough the tracks were there first and the town later – and they rarely had to build bridges to cross roads. The tendency, especially since money was much scarcer than in Europe, was to build railways quickly and cheaply, and this policy was encouraged by the government, which often granted to the companies large tracts of land in the country to be served by the new line, on condition that trains were running by a given date. The route could always be levelled, straightened, or improved by rebuilding later, and line relocations in the USA are still continuing, although they are quite rare in Europe.

There were a few horse tramways in the Eastern States, built often to act as canal feeders; and it was on one such, the Delaware & Hudson Canal Company's line at Honesdale, Pennsylvania, that the first "road-service" locomotive in America first ran in 1829. It was the Stourbridge Lion, a Killingworth-type engine built in England

by Foster & Rastrick of Stourbridge. Unfortunately it was too heavy for the track, and was taken out of service. Steam locomotion really started in America on the Baltimore & Ohio Railroad, an ambitious project commenced in 1829. By 1835 steam power ruled the tracks of the B&O to the exclusion of horses, and many other railways were following suit.

RAILROAD DEVELOPMENT: 1850 – 1900

The second half of the 19th century saw the railroad reach maturity and become a world-wide technical, economic, and social phenomenon. In the earlier part of the half century, railroad accidents became frequent and serious, as locomotive and car sizes grew rapidly, overstraining tracks and bridges. The first steel rails were introduced in England in 1857, and the first steel bridge was built, over the Mississippi at St. Louis, in 1867-73. Other major technological advances included automatic electric block signalling, telegraphic train dispatching, automatic coupling, and air brakes. Railroads learned to work together on common standards for brakes, couplers, and wheels, to permit interchange of equipment among different lines.

As the country where the railroad originated, Great Britain was the first to experience intensive building. Construction of new lines peaked there during the 1840s, when some 4,500 route miles (7,200 km) were laid down, and remained at a high rate during the next two decades. By 1870 Britain had about 13,500 miles of railroad, largely double tracked. In the remaining three decades of the century the pace slowed down, but other important developments took place. Physical plant of the main lines was improved. In Scotland bridges were built over two great firths of Tay and Forth. The first built over the Tay, on wrought-iron piers, was blown down in a gale (1879) and was replaced in steel. The Forth was bridged by the world's longest span bridge, a giant cantilever (1890). The first world's longest underwater tunnel was driven under the Severn for the Great Western Railway (1886). First-class sleeping cars were introduced on trains between London and Scotland in 1873, and dining cars on the Great Northern's London to Leeds line in 1879. On August 22, 1895 competing trains of two lines raced from London to Aberdeen, Scotland, both completing the run at average speeds in excess of 60 miles (100 km) per hour.

Meanwhile, countries in other parts of Europe and throughout the world were getting their first railroads or expanding their small beginning networks to national proportions.

RAILWAY BOOM IN THE MID-19th CENTURY IN BRITAIN

During the 1830s the first pans of the main-line inter-city network began to be laid down in Britain, and by 1841 you could travel by train from London to Brighton. Southampton. Bristol, and Birmingham, while branching or extending from the London & Birmingham Railway were lines to Liverpool and Manchester, Leeds, Derby, and York. These railways had not been in business for more than a few years, but they rapidly proved two things to the whole country. First of all, they gave a very useful and convenient service for passengers and freight which was of great advantage also to the districts served in opening up new markets for their produce. Secondly, the railway companies were profitable, and paid a very reasonable return on the money invested in them. By 1841 there were some 1,500 miles of railway in operation in Britain. For the next couple of years there was rapid but fairly steady growth. During 1844 and 1845 Parliament had laid down a broad legal framework for the railway system, which remained unaltered for the rest of the century. A department of the Board of Trade was set up with powers to regulate matters of railway safety: certain minimum standards of service were laid down, including a requirement that each line should run at least one train a day, at an average overall speed of at least 12mph, carrying passengers at a fare not above a penny a mile; and the state was given power to control or reduce the charges of any company which paid unreasonably large dividends. But the state did not concern itself with the detail of where railways were to be built, and imposed no plan or strategy. Provided it took its chance, survived the debate, and raised enough money, any project was as good as any other. And in spite of the upheaval, railway construction proceeded apace.

By 1850 there were some 6.500 miles of line open, and the railway map of Britain looked not unlike today's main-line network. There were some gaps, but not many. The most apparent was the lack of a railway across South Wales, which was not ready until 1852. Twenty years from the opening the Liverpool & Manchester,

therefore, the national railway system was established throughout; later construction was a matter of filling in gaps.

THE IRON HORSE CONQUERING AMERICA

The late nineteenth century belonged to the railroads. They were of crucial importance in stimulating economic expansion, but their influence reached beyond the economy and was pervasive in American society at large. The story of the Iron Horse in nineteenth-century America is one with many aspects and paradoxes and deserved a closer look. Which technological developments brought forth the railroads, and how were they managed once they grew beyond small companies? What role did they play in the turbulent times of the Civil War? How did they change the American landscape and its native people? What did the railroads mean to politicians, entrepreneurs, the working class, and immigrants? In short, what was the impact of the railroads on nineteenth-century American society?

The first company to begin actual operations was the Baltimore and Ohio, which opened a thirteen-mile length of track in 1830. It used a team of horses that pulled a train of passenger carriages and freight wagons along the track. Steam locomotive power did not come into regular service until two years later. The dream of connecting Baltimore and the Ohio River by railroad did not come true until the 1850s. In 1831 the Mohawk and Hudson in New York began running trains between Schenectady and Albany, a distance of sixteen miles. By 1836 more than 1.000 miles of track had been laid in eleven states.

But the railroad was not born with the importance later generations would give it. It was not viewed as being essential to economic development. On the contrary; railroads were generally seen as having only limited commercial use. Extreme skeptics emphasized the dangers of the railroad. They argued that the unrefined tracks were unsuitable for regular service, that the sparks thrown off by the engines would set fire to buildings and fields, and that speeds of 20 or 30 miles an hour could be dangerous to the wagons, road and loading, and human life. More sober were critics for heavy freight. Even railroad executives seem to have had a limited conception of the role of the railroads at first.

FINANCIAL BACKGROUND FOR AMERICAN RAILROADING

In the years from 1820 to 1870 when corporations were still a novelty, private groups needed capital to construct bridges, canals, turnpikes, and railroads, to establish and to engage in manufacturing. The corporate form, with its legal devices of stock and bonds and limited liability of stockholders for the debts of the business, made it easier to raise capital. Under the corporate form, large merchants and small investors could get together in the confidence that each risked only his investment and not his fortune, home, or farm.

First with the trunk-line railroads of the 1850s American corporations experimented with new forms of management. The Erie Railroad had four thousand employees, not confined to one yard but spread over five hundred miles of track. Not one office handled the cash: hundreds of station agents and conductors took in the company's money. Mere size was not the extent of the manager's problems. These were times of rapid technological change in railroad construction and car design, as well as times of fierce competition. The manager could not fall behind on these developments and had to make quick decisions, such as merging with minor roads or cutting rates in order to attract more traffic. It was also a time when unscrupulous financiers maneuvered the stocks and bonds of the railroads for personal wealth, so that many firms were harassed and sometimes destroyed by these manipulations.

The necessity for dependable coordination of managing daily business transformed the trunk-line railroad into a modern centralized corporation. The Erie Baltimore & Ohio, and the Pennsylvania Railroads were all pioneers in bureaucratic innovation. Between 1850 and 1880 they established the fundamental structure of the American corporation. Railroad management naturally divided into three departments - finance, operations, and traffic - each with distinct responsibilities. Finance was concerned with the collection and distribution of revenues as well as with issuing stocks and bonds. Operations controlled the movement of trains and their maintenance, while emphasis was on centralized control, because profits accumulated when all departments worked as one comprehensive undertaking.

TO BE OR NOT TO BE: RAILROADS IN COMPETITION

Railroad fever spread over the nation. In community after community, local newspaper editorialists, politicians, bankers, merchants, manufacturers, and fanners expressed concern for the loss of markets, the necessity of seizing new commercial opportunities, and the importance of transportation linkages. Discussion took place in public forums, newspaper columns, private offices and homes, as well as in community, state, and eventually federal institutions. Debates focused not only on the necessity of improving internal transportation, but also on the respective advantages of natural waterways, turnpikes, canals, and railroad systems.

Railroads and canals were soon engaged in bitter competition. For a time, the Chesapeake and Ohio Canal Company kept the Baltimore and Ohio Railroad from coming through the narrow gorge of the upper Potomac, which it controlled; and the state of New York prohibited railroads from carrying freight in competition with the Erie Canal and its branches. But the railroads had so many more advantages, that they defeated the canals wherever free competition existed. The new developments made it possible for trains to pass through mountainous regions as well as over flat terrain. Critics no longer questioned the feasibility of railroads. Entrepreneurs could see that the “iron horse” had taken the place of the waterways in inland transportation and proposed vast projects for covering the nation with railroads. J. W. Scott, editor of the Toledo Blade, claimed that no nation could maintain its position among the foremost in civilization without fully exploiting this new means of transportation.

During the 1850s the object of most promoters was to reach the Missouri River, but by the close of the decade, activity shifted to Iowa extensions or railroads from Chicago. The pioneering line in that state was the Chicago and Northwestern Railroad: in 1855 its tracks reached the Mississippi opposite Clinton. Iowa, and during the next decade it thundered across the state on to Council Bluffs on the Missouri. Close behind was the Rock Island Railroad. To the delight of amazed Westerners, it opened the first bridge across the Mississippi, a year after reaching it in 1854 and crisscrossed it by a number of east-west roads providing quality transportation.

DEBATING A TRANSCONTINENTAL RAILROAD: NORTH & SOUTH

By the 1850s the line of white settlement had moved West to the great bend of the Missouri River. Large sections of this region turned out to be quite suitable for farming. Prospective settlers in the Old Northwest states urged the government to open this fertile land to them, provide territorial governments, and remove the Indian tribes – despite the solemn promise of the United States to the Indians that their reservations were holy. There was not much protest from any segment of white society to the violation of Indian rights consequential to these demands. Bui the idea of further settlement raised two issues that proved highly divisive and gradually became inseparable: railroads and slavery. With the westward expansion, communication between the older states and the so-called trans-Mississippi West (the areas west of the Mississippi River) became more and more critical. Broad support began to emerge for building a transcontinental railroad. The problem was where to place it – and in particular where to locate the eastern terminus. Northerners favored Chicago, the rapidly growing capital of free states of the Northwest. Southerners supported St. Louis, Memphis, or New Orleans – all located in slave states. In other words, the transcontinental railroad was becoming entangled in sectionalism, as was nearly everything else in the 1850's. It had become the coveted trophy that both North and South were desperate to win.

But two decades before the Civil War the nation was still in a pioneer spirit. The depression of 1837 was past and the panic was over. "Ours is a country of beginnings, of projects, of vast designs and expectations", Emerson wrote. "It has no past: all has an onward and prospective look". Symbolic of the economic growth of the years to come, was the vision of Asa Whitney. This China merchant of New York looked over the western plains and the Rocky Mountains to the Pacific, where he saw a railroad joining that ocean with the Atlantic. In Whitney's eyes, a transcontinental railroad was an indispensable part of the nation's destiny. "Now only is the time in which it can be done ... someone's whole efforts, energies, and life must be devoted to it." Asa Whitney would be honored to be that someone.

RAILROAD DEVELOPMENT: 1850- 1900

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US RAILROADS IN THE SECOND HALF OF THE 19th CENTURY

Railroad construction in the United States was on an even larger scale than in Britain in the 1850s when more than 21.000 route miles were built. Construction was slowed down by the American Civil War (the first war, incidentally, in which railroads played a major role); but it resumed on a large scale immediately afterwards, reaching a peak in the 1880s: in the year 1882 alone 11.500 miles were built, a record exceeded in 1887 with a total of 12.800 miles. Altogether, more than 70.000 miles were built in the decade. Construction continued at a relatively high level through the 1900-10 decade.

The major thrust of American railroad development was westward. The first locomotive in Chicago, the "Pioneer" of the Galena and Chicago Union Railroad made its first run on October 25, 1848. The first railroad reached the Mississippi from Chicago in 1854. On May 10, 1869 the first transcontinental route was created when at Promontory, Utah, the Union Pacific Railroad, building west from Omaha, Nebraska, met the Central Pacific railroad, building east from Sacramento, California. Ultimately there were about nine major routes leading from the Midwest or South to the West Coast.

Although the United States railroad system, like that of other countries, was essentially a product of private enterprise, it received important government assistance, in early years from state and local governments, and after the Civil War from the federal government in the form of land grants. Such grants, totaling about 53,000 ha went to 29 railroads for about 18.000 miles of line (about 8 percent of total US mileage). They made it possible for the railroads to push lines across prairies and mountains almost entirely undeveloped and very sparsely settled.

Comparing with the USA and Canada, railroads failed to play such a strong role in opening up the country in Australia. Railroad development was even handicapped because each state laid track to the gauge it considered suitable for its own needs, so freight and passengers had to be transshipped from one line to another.

CASE STUDY 02
RAILROADS IN THE MODERN WORLD

Do the following assignments to text abstract determined by your language supervisor as that for you to be analyzed individually

1. Write out of the text abstract all the Subjects. Analyze them and classify the means to express the Subject in English language.
2. Write out of the text abstract all the Predicates. Analyze them and classify the means to express the Predicate in English language.
3. Write out of the text abstract all the Objects. Analyze them and classify the means to express the Object in English language.
4. Write out of the text abstract all the Attributes. Analyze them and classify the means to express the Attribute in English language.
5. Write out of the text abstract all the Adverbial Modifiers. Analyze them and classify the means to express the Adverbial Modifier in English language.
6. Write out of the text abstract all the modal verbs. Explain their meanings and the ways to express English verb modality by means of Ukrainian language.
7. Write out of the text abstract all the Grammar structures having no Ukrainian equivalents. Explain the ways to translate such structures by means of Ukrainian language.
8. Write out of the text abstract all the abbreviations; give their non-contracted equivalents, compare the translations of the abbreviations to their non-contracted equivalents. Analyze the text abstract on the availability of non-contracted word combinations having generally-used abbreviations.
9. Write out of the text abstract all the international lexis; give their Ukrainian equivalents. Analyze the text abstract on the availability of Ukrainian words having generally-used international equivalents.
10. Write out of the text abstract all the “false friends of a translator”; give their proper meanings. Explain where it is possible the differences or peculiarities in the

meanings of the analyzed words. Explain the rules of choosing the proper lexical unit while translating.

11. Write out of the text abstract all the words used in their figural meaning; give their direct meaning. Explain the reasons of their using in a figural meaning.

12. Translate the following text abstract using available academic or electronic dictionaries (Multitran, Prompt etc.).

13. Make a plan of the text abstract.

14. Compile a vocabulary to the read and translated text abstract.

15. Compile a glossary of terms with their explanation in English to the analyzed text abstract.

RAILWAY REVOLUTION OF THE 20th CENTURY

Rail transport has changed more dramatically in the past three of four decades than in the whole first century of its history. It is not just that steam traction has been superseded by diesel or electric power on every major rail system of the industrialized world. Menaced first by the automobile and the truck, then by the jetliner and the private plane, railways have been forced to develop their technology at a pace faster than ever before, to find means to move people and freight ever faster and more reliably but, at the same time, with fewer men and less expensive equipment. Growing realization of the need to conserve energy has added global importance to their achievements.

Today more than 100 mph is the everyday standard for the supremely comfortable, air-conditioned inter-city trains which criss-cross Western Europe in an intensive service. The Japanese Bullet Train high-speed railway success has pushed the development of high-speed rail system. Britain entered the market with HST (Higher Speed Train). 125 mph that made its first run on the London-Bristol route in 1977. France has created TGV (Train Grande Vitesse) that travels the 265 miles from Paris to Lyons on new track in two hours. The fully automated inter-city railway is just a step to be reached. The world is hurrying to build striking new urban systems both above and below ground, despite enormous capital costs to avoid core

strangulation by the automobile. And in freight transport an equally impressive transformation is taking shape as railways set up the equivalent of long-haul conveyor-belts to move containerized goods and "piggyback" road trucks and trailers between main centers at a speed of above 75 mph or to feed vast trainload tonnages of raw materials from port or pithead to manufacturing plants. Goods by the wagonload are nowadays under the constant surveillance of computers – each is processed through sorting yards under push button control, where even the shunting or switching locomotive may be remotely controlled by radio. Such triumphs have provided the railways in many countries with a powerful reply to the challenge of other forms of transport with threatened their existence.

BR IN THE SECOND HALF OF THE 20th CENTURY

One important development did take place during the 1939-45 war, when Bulleid, who had taken over as chief mechanical engineer of the Southern Railway, introduced a new type of suburban electric train for the Southern with 9ft-wide bodies of welded steel construction. Inside, the seats were taken almost up to the outer body skin and the early coaches were very austere and cramped, not surprisingly as Bulleid had succeeded in fitting 11 compartments, each seating 12 people, into a coach 62ft long. At the time of nationalization Bulleid was also experimenting with double-deck trains and eventually produced an eight-car electric train with interlaced compartments on upper and lower levels. Only one train was built and the Southern standardized on a traditional side-swing-door coach, open throughout, with a central passageway and two-plus-three seating. A similar arrangement was adopted for nearly all subsequent BR suburban electric stock, although Glasgow suburban trains had sliding doors. Now the pendulum is swinging the other way for BR is likely to standardize sliding door coaches for future commuter trains.

From the start, the new BR main-line corridor coaches were entirely of steel, but internally they differed little from previous designs, with wood-grain decor and rather dull "moquettes" for seating. There was little change in design for more than a decade, despite the production of numerous prototypes and the Mark I fleet spread to all main lines throughout the country. From the mid-1960s, big double-glazed

windows, better heating, ventilation and soundproofing, wide doors and modern decor, were gradually introduced, to provide a Mark II standard, and the latest version, which has reverted to small windows, is fully air conditioned. At the other end of the scale, from the mid-1950s BR introduced a large fleet of coaches formed into diesel multiple units. They were built for local and suburban use and some had bus-type seats. In the 60s BR developed a new coach for the high-speed train – Mark III coach, a longer vehicle than any existed before. It has a body length of about 75ft and a width of 9ft, is designed for speeds up to 125 mph and is fully air conditioned. A feature is the abolition of individual compartments and all seats for both first and second-class passengers are in open saloons.

AMERICAN RAILWAYS

The situation with the US Railways is quite ambiguous. On the one hand, the USA is a great railway power, on the other, the railways have been always granted little government aid. In the 1970s a number of U.S. railroads faced serious financial difficulties and some went into bankruptcy. Financial conditions improved somewhat in the 1980s. However, profits in the railroad industry remain lower than those in almost every other major industry.

The speeds of 250 km/h are now practical for the express trains in the USA. Railroads in the United States operate more than 21,000 locomotives; almost all are diesel-electric. Only a few U.S. railroads use electric locomotives, and none uses steam locomotives in regular service. Many railroads in the United States are replacing the old short-length rails with new ones, most of which measure about ¼ mile long. Workers weld together rails' lengths of 39 feet (12 metres) or longer to make the 1/4 mile rails’ lengths. Welded rails have fewer gaps and so produce a smoother running than do rails joined in many places. Welded rail is also easier for railroad work crews to maintain. The United States as well as Canada and most European countries have a standard gauge of 4 feet 8 1/2 inches (1,44 metres).

The United States have about 500 railroad companies. All of the major railroad companies except one are owned by private investors or by “conglomerates” – corporations that control a number of firms in various fields. The exception is the

Alaska Railroad, which is owned by the Alaska state government. The main railroad companies are: the Conrail (Consolidated Rail Corporation); the Burlington Northern Inc.; the CSX Corporation; the Norfolk Southern Corporation; the Atchison, Topeca and Santa-Fe Railway Company; the Union Pacific Railroad Corporation; the Southern Pacific Transportation Company, etc.

The U.S. government classifies railroads according to operating revenue (money earned from operations). Companies with operating revenue of $ 88 million or more a year – are the Class I railroads, with the operating revenue of $ 18-88 million – are the Class II railroads, with the operating revenue less than $ 18 million a year – are the Class III railroads.

US RAILWAYS REFORMING

North America has been, perhaps, the last redoubt of the private-enterprise main-line railway. But disadvantages of this finally became evident for everybody. An uncomfortable number of US railroads are finding it's progressively harder to generate the money for adequate reinvestment in traction and rolling stock, or even to keep the track in basic order. The late 60s saw the whole list of bankruptcy-petitions filed by northeast railway companies. A total shutdown of railroads over this area was a very real possibility. It was forestalled by the Rail Reorganization Act of 1973. With the objective of providing the eastern US with a "financially self-sustaining rail service" it established first the United States Railroad Association (USRA), a body representative of the Government, railroad management and unions, and customers, to plan a rationalized rail network; and second. Consolidated Rail Corporation – Conrail for short – to run it. The final arrangements were enshrined in the Rail Revitalization & Reform Act of 1975, or the "4R Act" which tidied up a lot of loose ends affecting the rehabilitation of ailing US railroads in general, including an offer of Federal money for the restoration of dilapidated track. The cost schedule attached to the "4R Act" ended up at around $ 6 billion of Federal money and as a result both Administration and Congress choked on it for a time – in fact President Ford threatened a veto at one stage. One-third of the "4R Act's" money was loans to get Conrail started. The rest of its money Conrail had to raise in the market. Washington

shied from any idea of wholly funding Conrail. This must be above suspicion as at worst a “quango” – a “quasi-non-governmental-organization”.

At the start of its operational career on 1 April 1976 Conrail jumped into second place behind Burlington Northern in the league table of the USA’s biggest railroads, with a 19,200 route-mile system, over 4600 locomotives, more than 151,000 freight cars, a daily catalogue of some 1500 freight trains (but also a substantial amount of short-haul passenger service in the heavily populated northeast, the deficits of which it was at first unable wholly to escape as its creators intended) and 15 major marshalling yards. Unfortunately, Conrail inherited a sheaf of problems, and this resulted in tremendous economic difficulties in the next years.

FRENCH RAILWAYS: ENGINEERING REVOLUTION

As soon as WWII was over French Railways (SNCF) set out determinedly not only on a main-line electrification programme as rapid as resources would allow, but on a complementary redesign of main-line operation to optimize the high reserve of power in mind for the new electric traction. Centre-piece of the operational plan was to be a high-speed passenger service. So with its first post-war 1.5kV DC electrification complete from Paris to Lyons in 1951 the SNCF ushered Europe into the 70-75mph range of intercity end-to end average speed as early as the winter of 1952. But though Europe’s post-war scarcity of coal had the French Government as well as the SNCF eager for ongoing electrification, the first costs of setting up current supply and catenary were daunting. The capital cost deterrent was relaxed when the SNCF’s electrical engineers refined to perfection a traction system that could adapt high-voltage alternating current at the industrial frequency straight from the national supply system to the use of the direct current motors which were most practical in rail locomotives. That greatly reduced the scale and cost of line side supply installations and permitted less ponderous and hence cheaper catenary and catenary structures. Also promised by the new technology were superior adhesion characteristics and efficiency in the locomotives themselves. The advantages were then immeasurably enhanced by the 1950s adaptation of materials such as germanium and silicon for semi-conductor rectifiers, whereby the apparatus to mutate AC line supply to a DC

traction motor on the locomotive was strikingly reduced in size and weight. Now a 4000-5000hp AC four-axle locomotive of less than 100 tons' all-up weight became a practical proposition. The next milestone was evolution of compact multi-voltage traction equipment, enabling a locomotive to operate with equal facility and on near-standard output of power under AC or Dc wires (and if necessary at varying voltages in each case) which could give it the freedom of Western Europe's electrified network (the 3kV DC of Belgium and Italy, and 15 kV $16\,^{2}/_{3}$ Hz AC of West Germany, Switzerland and Austria as well as the 1.5 kV DC of France and the Netherlands and France new 25 kV 50 Hz). This enabled the SNCF to pursue AC and DC electrification in parallel as logistics and local circumstances dictated.

JAPANESE RAILWAYS: OPENING A NEW WORLD

Japanese National Railways (JNR) had two sharply contrasted facets in the second half of the 20th c. The glossy side promoted worldwide and symbolic of the whole system so far as the Western man-in-the-street is aware, was the "Bullet Train" – the 130 mph electric multiple-units of the standard gauge Shinkansen, or "New High-Speed Railway", which was inaugurated with the opening of the New Tokaido Line from Tokyo to Osaka. Despite its colossal initial cost the New Tokaido Line's pace and intensive regular-interval service straightaway pulled in such a weight of business that just in six years it showed a financial surplus even after coverage of depreciation and interest on the cash borrowed to build it. The other and rather less assiduously reported or publicized facet of JNR was the bulk of its network, the historic Japanese railway built on the 3ft 6in gauge. Since the 1950s it had been losing traffic to other modes at one of the most depressing rates in the industrialized world and accumulated losses which submerged all the Shinkansen gains. The first sign that downward trend was halted appeared only in early 1979. History and Japanese tradition combined to lock the JNR in a fairly intractable situation. The 3ft 6in gauge is totally unsuitable to a railway catering for a population and an industrial economy of Japan's magnitude. The mountainous character of three-quarters of Japan's land space has packed industrial and population growth into the littoral areas of the island, aggravating the difficulties of the narrow-gauge system. The surging

growth of the Japanese population since WW II has heightened the dominance of passengers in JNR traffic. The proportion of passenger-miles recorded per annum to freight ton-miles is roughly five to one, compared with a ration of only 1.5 to one on British Rail. Measured in passenger-miles JNR is burdened with almost seven times the passenger traffic of British Rail, yet the difference in system size is a narrow one: 13,200 route-miles for the Japanese network against BR's 11,100 (in 1980). The commuter traffic of London and every other European city pales against rush-hour rail movement in Tokyo. In the Tokyo area the JNR alone was dealing with ten million each working day and many more were riding on the independently owned local railways in the capital's metropolitan area.

CANADIAN RAILWAYS REFORMING

In the 1970s Canadian long-haul passenger services were in the same state of crisis as those of the USA. But with the purchases and refurbishing of discarded US streamlines equipment and some vigorous and astute marketing Canadian National had striven to reverse the downward curve of its passenger carryings. In the early 1970s CN had to campaign vociferously for relief from mounting losses on its passenger services. As in the USA, extinction of the long-haul passenger train was politically unthinkable, so Pierre Trudeau's Liberal administration more or less followed the US example: in 1978 inter-city passenger services were regrouped and integrated under the management of Amtrak-style Federal agency named VIA Rail. A natural corollary of the new order was a rationalized timetable, in which the most conspicuous economy was the merger of the two great Canadian transcontinentals, Canadian Pacific's (CP) "Canadian" and Canadian National's (CN) "Super Continental", as one over the Sudbury – Winnipeg sector. As freight haulers, state owned CN and private enterprise CP are both financially healthy indeed CN must be the most remunerative state railway system for its size outside of Russia – and consequently VIA Rail plies its rains over track that is generally in far better shape than many of Amtrak's pathways. Nevertheless the Canadian Government was persuaded to recognize that passenger trains would not hold their own in the populous intercity corridors without acceleration, and that that would predicate infrastructure

improvements. It agreed to finance upgrading between Montreal and Quebec, though the sum allocated to this pilot exercise had the look of a gesture rather that serious long-term intent when it was against vastly larger amounts of Federal money lavished on experimentation in other modes of transport. To operate the Montreal-Quebec corridor route the government bought Canadian-devised automatic tilt-body equipment, the LRC – for "Light, Rapid, Comfortable". The LRC-mates diesel-alternator power cars with non-powered trailers, and is not conceived as a fixed formation unit but for t1exible push-pull assemblies of one or two cars with as many trailers as its operators may deem suitable for traffic demand or route configuration.

THE PIONEER IN RAILWAY SIGNALLING AND TELECOMMUNICATION

The German Federal Railways, or DB, and West Germany's signalling and telecommunications industry were post-World War II frontrunners in the contrivance of signalling control centres that could regulate traffic over the whole of a complex metropolitan layout with the aid of electronics. In 1957 one was erected at Frankfurt/Main where, on the top operating floor, it needed only seven men to signal not only 24-platform main station (since enlarged only by the subsurface S-Bahn (suburban local trains) platforms) and the seven different routes converging on its throat, but also the extraordinarily ramified cat's-cradle of inner orbital routes laid down and interconnected over the years to create through routes, primarily for freight, because the station is a dead-end terminal. Five of the operators were signalmen, each seated at a desk displaying diagrammatically a section of the layout and studded with signal and point-setting repeater lights, apertures automatically illuminating the timetable number of the train occupying each track section (the number moving from aperture to aperture with the trains' progress) and push-buttons to set up or reverse a whole route at one jab. The other two operators were traffic regulators, coordinating the whole job from desks fronting a panoramic illuminated display of the entire peripheral layout and the trains approaching, departing or progressing throughout. In the station area alone these seven men were covering over 5000 trains or shunting movements every 24 hours.

As early as the 1950s the signal engineers had built into the Frankfurt installation provision for trains to signal and set their own route through some junctions on the orbital routes. Automatic route-setting can be actuated by the train describer apparatus, since the digits of a train's working timetable number include one or more indicative of its route. Once the number has been fed into the train describer apparatus through an input keyboard at the signalling point where the train is dispatched into the automatic train describer's control area, therefore, the equipment can be arranged to detect the route code at a specific point on the layout and route-set accordingly. Electronically a train's successive passage of track circuits as it threads the layout automatically moves its numerical description in corresponding steps through the train describer equipment.

FRENCH TURBINE TRAINS

The only railway company that applied gas turbine power to production train-sets with conviction and success was the SNCF. It introduced in 1970 at the route Paris-Caen-Cherbourg as the first attempt to reshape an inter-city service on a near standard pattern of pace and comfort combined with enhanced frequency and to halt the demand reducing trend. At the time the compact, lightweight turbines evolved for helicopters by the aerospace industry held high promise for the advance of speed on routes where traffic levels could not support electrification economically. The Turbomeca Turbo III turbine employed in the SNCF's first series of train-sets, Type ETG, together with its hydro-mechanical transmission and ancillaries was less than one-third of the weight of a diesel engine of equivalent output. Married to lightweight bodywork, turbine traction could offer not only a high power/weight ration for smart acceleration to and maintenance of high speed on well-aligned track, but also vehicles with low axle-loading and a low centre of gravity which could make a good pace over sinuous routes. The turbine's characteristically higher fuel consumption that that of a diesel of comparable output was in those days no cause for serious concern – a trifling discrepancy quite easily accommodated in the balance sheet by the turbine unit's higher availability for work and hence its capability of generating more passenger seat-miles over a given period of revenue-earning services. The four-car

ETGs with a 1150 hp turbine in one power car and a 450 hp diesel engine in the other to boost the 175 k/ton unit's acceleration from rest, were arranged for 112 mph maximum and fitted with electro-magnetic as well as conventional air brakes to secure rapid deceleration from three-figure pace. Sadly the oil price explosion had aggravated the penalty of the turbine's fuel thirst so severely that all the other advantages of a turbine-powered unit were outweighed. The balance was pulled back some way by implementing an RTG type that could observe the schedule with only one turbine cut in for over half the journey. This cut fuel costs considerably and also reduced total running expenses because more intermittent use of the turbines allowed a lengthening of time between overhauls. But this was remedial work to avoid premature sidetracking of the turbine trains, not an advance that would keep turbine traction in the future reckoning of world railway planners.

RAILWAYS AT THE FIFTH CONTINENT

Amongst the world's developed countries scarcely any railway system has more areas of modernization to overtake than Australia's. Some large-scale projects of the 1950s-1990s to tackle the crippling heritage of mixed gauge, to improve access to remote mineral resources or to enlarge the capacity of city commuter networks cannot mask the consequences of fairly parsimonious investment in railways overall since World War II. These consequences were patent in the hectic slide of every Government-owned railway bar one from a working surplus – or very near it – into heavy deficit between the mid-1960s and mid-1970s. The red ink was not the result of dwindling traffic. On the contrary, in the boom years immediately preceding OPEC's inflation of oil prices some Australian railways were recording unprecedented freight tonnages. The trouble was that the extra traffic couldn't carry that it had been paid because so much of it had to be moved in antiquated low-capacity rolling stock.

Outside North America, Australia is the only industrialized country where railways do not confront the competition of modern air and road transport as a unified national system. But at least the private enterprise railroads of America have standard gauge in common. Australia still wrestles with the effects of the muddles of sheer

bloody-minded independence which had their pioneering forefathers build New South Wales and Queensland main-line railways on the standard gauge, South Australian and Victorian railways on 5ft 3in gauge, and Western Australia's railways on the 3ft 6in gauge. As late as the early 1960s it was still impossible to complete an east-west transcontinental transit, whether passenger or freight, without break-of-gauge trans-shipment.

The stimulus came from Western Australia, where the railways showed the best financial results of any of the state systems. The Western Australian initiative prompted action at the other end of the country to get rid of the remaining gauge-breaks in the through route from New South Wales. At the same time the existing standard-gauge sectors of the transcontinental line were effectively improved. These various enterprises were finished in 1969 and in February of 1970 the achievement was crowned with the rebirth of the prime transcontinental passenger service, the "Indian-Pacific", a superb air-conditioned standard gauge train of stainless-steel-bodies luxury stock.

NARROW GAUGE FREIGHT TRAINS OF SOUTH AFRICA

The present-day performance of South African Railways (SAR) as a freight carrier has rewritten as many historic conceptions of a narrow-gauge system's potential as that of Japan's 3ft-6in-gauge city commuter lines has in the passenger sector. No standard gauge railway in Western Europe matches the maximum trainload tonnages regularly shifted in some areas of the SAR. Trains of 6000 tones gross are now common in practice even where gradients are as steep as 1 in 70. SAR has learned to live with and make the best of its inheritance of a 3ft 6in gauge from pioneers preoccupied with economy in construction, as a result of which they also bequeathed their successors steep gradients and a great deal of speed restrictive curvatures wherever the terrain was unfriendly. Well over 90 percent of SAR's passenger traffic is local, the greater part of it focused on the suburban networks of Durban, Cape Town, Reef around Johannesburg. Thus there is no pressure for quicker inter-city rail passenger movement (or national socio-economic need to

provide it) of the intensity which compelled Japan to throw off some of its narrow-gauge shackles and build standard-gauge Schinkansen.

South Africa, unlike Japan, is still rich in fossil fuels and other indigenous raw materials. Limitations imposed on long-haul road freight transport in the 1930s to safeguard the railways when the latter were relied upon to underpin national economic development are still substantially in force, though in recent years they have been relaxed in particulars that have made the competition for high-value merchandise goods much more severe and have crowded SAR out of the short-haul market. Consequently SAR's main technological thrust has been directed at the improvement of long-haul bulk transport efficiency. One of them is the High Stability or HS bogie, sometimes known as the Scheffel cross-anchor bogie in honour of the SAR Test Section chief who devised it and to denote an essential feature of its construction. In brief, the bogie allows each wheel-set a measure of self-steering so that the profile of the wheel is better matched to that of the railhead whatever the configuration of the track. This reduces any tendency of the wheel-set to "hunt" – that is, to yaw from side to side. It also limits wear and tear of track and running gear and allows sharp curvature to be taken faster that it is advisable with bogies of previously orthodox design.

TRANS-EUROPEAN NETWORKS

In parallel with integrating modes, the EU was integrating national networks to create trans-European networks (TENs). This was given priority status in the Maastricht Treaty on European Union. The aim is to transform the 12 networks into a single network of European dimension. Bottlenecks will have to be removed and missing links created. Remote and outlying regions of the EU will be integrated into the system. The development of TENs would be underpinned by series of measures. These would the better use of existing networks by modernizing equipment and by an improved flow of information between systems by using electronic data interchange (EDI) and telecommunications. There would also be a greater R&D effort, concentrated on interfaces between modes (so-called intermodal transfer points) and on technologies to improve the quality of service. The EU also supports a

diversification of investment sources for transport projects with greater reliance on private capital. The EU will concentrate its financial effort on stimulating projects of Europe-wide interest by helping to integrate regional and national projects and to connect distant regions to the European network.

European railway companies are planning to build 30 000 kilometres of high-speed track over the next 25 years. The revolution in rail travel has already begun, and high-speed trains of many different designs are now in operation. The fastest train in the world is the TGV-Atlantique 325, which reached a speed of 515.3 kph in trials in May 1990. It achieves an average speed of 300 kph. France plans a network of 4 700 kilometres of high-speed track, 700 kilometres of which have already been completed. Spain's new high-speed train, the Ave, came into service between Madrid and Seville at Easter 1992. The German intercity express (ICE), with a top speed of 280 kph, is geared to the needs of the German network. It is currently restricted to a maximum of only 160 kph. The ETR 500 is cutting journey times in Italy with speeds of 300 kph, while another Italian train, the Pendolino, has a titling mechanism which makes it particularly suitable for routes with many bends. British rail is also developing its new generation of electric trains. Denmark's IC train, with its distinctive rubber "nose", runs at 200 kph. All of these trains will offer even higher standards of comfort.

MASTER PLANS AND TRANS-EUROPEAN NETWORK

Proposals for a European high speed network, initially based on national projects, took shape in several stages. First, the European railway companies put together "Proposals for a European high speed network" within the CER, a UIC group comprising the railways of the European Union. This was submitted to the EU Commission at the end of 1989 where it was given a highly favourable reception. On this base, the Council of Ministers created a high-level Working Party for "High speeds", chaired by the Brussels Commission and including States, railway companies, industry and other partners. This group drew up a master plan of European high speed rail links and submitted its report entitled "The European network of high speed trains" in late 1990. On 17 December of that year, the Council

of Ministers gave its approval to both the report and the "European master plan of high speed links" (time horizon: 2010). This initial report contained a master plan for a European network of high speed trains, a list of 15 key links of particular importance from the stand-point of the EU and recommendations for guaranteeing network interoperability. The work of the group had continued since then. Studies had been carried out to ascertain the cost-effectiveness of the project, its feasibility and its physical and social compatibility with the EU environment. This second report gave the results of studies undertaken on the socio-economic impact of the network on the EU, the approach to be adopted regarding environmental constraints and on possible synergy between models. The master plan had been completely revised to take account of the profound political changes in mainland Europe. Next, particular attention was paid to the matter of funding. Various possible approaches were considered in the search for potential solutions to the problem of the substantial investments involved. The total cost of the network was estimated at 200 billion ECU for the whole of the European Community plus Switzerland and Austria. Within this total the cost of the key links was set at an estimated 70 billion ECU. To fund these amounts, it was necessary to call on both financial markets and the public purse. On 1 November 1993, the Treaty on European Union signed at Maastricht came into force. Chapter XII of this treaty empowers the Union to develop "trans-European networks" in telecommunications, energy and transport.

200 YEARS OF PROGRESS (1)

The first trains were drawn by horses and transported such products as coal, ore and timber in mines and factories. Later on, the horse railways were used as passenger transport in large cities. However, the boom years of early railways began with the invention of the steam engine at the end of the 18th century. One of the first attempts to use the steam engine for trains was made in 1808 by Richard Trevithick, an English engineer, who demonstrated his working model in London. This locomotive was looked at with great interest when it ran on a circular track of iron rails. For a shilling the public could travel in a carriage drawn by the steam engine. The locomotive was called "Catch-me-who-can", and people could really catch it

because it developed only 12 miles per hour (mph). The locomotive was too heavy and finally broke the rail, thus ending Trevithick's career as an inventor. Yet, he can be rightly credited as the father of steam locomotive.

At about the same time, George Stephenson, an engineer of the coalmine of Killingworth, England, constructed the engine called Locomotion. This locomotive was much smaller and lighter than the steam locos developed later on, and it was much slower. However, it could draw a small train of loaded cars on the railway and developed an unheard-of speed of 13mph (21km/h). Stephenson was also the builder of the world's first public railway – the Stockton & Darlington Railroad (1825) using both steam and horses as tractive power. It began regular service with the only locomotive every day except Sunday.

Yet, Stephenson's really big triumph came in 1829 when he was asked to build another railway, now steam-powered, between Liverpool and Manchester. It was the first truly successful passenger railway in the world. The company offered a prize of 500 pounds for the best steam train. The prize was won by George Stephenson with his famous train The Rocket, which is now in London's Science museum. It could travel at 29mph, which was very fast at that time. Soon the steam-powered railways were already in wide use. By 1854 every town of any size in England was connected by rail.

200 YEARS OF PROGRESS (2)

The problem of adhesion was one which vexed theorists most at that time, perhaps because experience had made people aware of the difficulties of braking wagons in wet weather on steep descents laid with iron rails. Less of a theorist, William Hedley, the engineer of the William Railway near Newcastle, built a wagon whose wheels were turned by cranks operated by a crew of men standing on top. By this means, and with the aid of ballast weights, he proved that in spite of everything an iron wheel had enough frictional bite, without assistance, to allow a locomotive to draw a useful load; and 1813 he introduced steam locomotives on the Wylam line. The invention of steam locomotives made the railway the first and the most important

means of mass transportation. In fact, until the invention of the motorcar in the early 20th century, railway had a monopoly on land transport.

Sometimes one can hear that the "golden age" of railways is over because we live in the age of high technologies and super-high speeds. Modern railways are ready to meet these challenges. Due to computer technologies high-speed trains become more and more "intelligent". They resemble aircraft in design, fully automated operation and speed (the world speed record now is 581km/h). Advances in rail transportation will make the trains still more powerful and our travel more comfortable with each coming decade. Millions of people all over the world spend their time travelling either for pleasure or on business. Anyway, railway is by far the most popular means of travel. In combining speed, comfort, safety and perfect service railways have no superior. But their most important function is to carry freight. Railways account for a major part of freight transportation, being, in fact, the backbone of the national economy.

The world is now a very different place from when railways were developed. In May 2004 Britain's National Railway Museum in York organized festivities to commemorate the birth of the world's first steam locomotive 200 years ago. The idea behind Railfest 2004 was to track the progress of rail transport from Richard Trevithick's locomotive of 1804 to Britain's new flagship Pendolino train. To better realize the challenges for modern railways, let us also look back at their start.

CASE STUDY 03
TRANSPORT AS A BRANCH OF ECONOMY

Do the following assignments to text abstract determined by your language supervisor as that for you to be analyzed individually

1. Write out of the text abstract all the Subjects. Analyze them and classify the means to express the Subject in English language.
2. Write out of the text abstract all the Predicates. Analyze them and classify the means to express the Predicate in English language.
3. Write out of the text abstract all the Objects. Analyze them and classify the means to express the Object in English language.
4. Write out of the text abstract all the Attributes. Analyze them and classify the means to express the Attribute in English language.
5. Write out of the text abstract all the Adverbial Modifiers. Analyze them and classify the means to express the Adverbial Modifier in English language.
6. Write out of the text abstract all the modal verbs. Explain their meanings and the ways to express English verb modality by means of Ukrainian language.
7. Write out of the text abstract all the Grammar structures having no Ukrainian equivalents. Explain the ways to translate such structures by means of Ukrainian language.
8. Write out of the text abstract all the abbreviations; give their non-contracted equivalents, compare the translations of the abbreviations to their non-contracted equivalents. Analyze the text abstract on the availability of non-contracted word combinations having generally-used abbreviations.
9. Write out of the text abstract all the international lexis; give their Ukrainian equivalents. Analyze the text abstract on the availability of Ukrainian words having generally-used international equivalents.
10. Write out of the text abstract all the “false friends of a translator”; give their proper meanings. Explain where it is possible the differences or peculiarities in the

meanings of the analyzed words. Explain the rules of choosing the proper lexical unit while translating.

11. Write out of the text abstract all the words used in their figural meaning; give their direct meaning. Explain the reasons of their using in a figural meaning.

12. Translate the following text abstract using available academic or electronic dictionaries (Multitran, Prompt etc.).

13. Make a plan of the text abstract.

14. Compile a vocabulary to the read and translated text abstract.

15. Compile a glossary of terms with their explanation in English to the analyzed text abstract.

THE BEGINNINGS OF MODERN TRANSPORTATION

The first electric trains and streetcars appeared in Europe and the United States during the 1880's. In the 1890's, the German engineer Rudolf Diesel invented the engine that was later named after him. In time, diesel engines replaced steam engines on many ships and on most trains. But of all the inventions of the 1800's, the gasoline engine was the one that brought the most far-reaching changes in transportation.

German inventors built the first gasoline engines during the 1880's and used them to power bicycles. During the 1890's, French engineers built the first gasoline-powered vehicles with automobile bodies. The first gasoline-powered buses and trucks were built in Germany during the 1890's. In 1903, two American bicycle makers, Orville and Wilbur Wright, used a gasoline engine to power a small airplane that they had built. The Wright brothers' plane became the first one to lift a person into the air and fly successfully.

Automobiles became the chief means of passenger transportation in the United States during the 1920's. As the number of automobile owners increased, so did the Demand for more and better roads. About 700,000 miles (1,100,000 kilometers) of surfaced streets and highways were built in the United States between 1900 and 1930.

The first commercial airlines began service in Europe in 1919. Airlines began operations in many other parts of the world during the 1920's. By the late 1930's, the

world's airlines carried 3,5 million passengers annually. During the late 1930's, Germany built the first planes with jet engines. All the early jet aircraft were warplanes. The first jet airliners began service during the 1950's.

The great advances in transportation during the 1900's have brought about enormous changes in people's lives. The development of commercial air travel has made long journeys routine. As a result of improvements in ocean shipping and in refrigeration, goods that were once available only in certain regions are now distributed worldwide. The development of the automobile has led to the growth of sprawling suburbs around big cities. Many suburbanites depend on their cars for shopping and other personal business. Without this convenient means of private transportation, suburban living would be impractical or impossible for many people.

TRANSPORT AND THE SINGLE MARKET

The transport sector makes a vital contribution to the European Union's frontier-free single market. Without efficient transport networks, two of the European Union's basic principles – the free movement of goods and of people – would not function. In preparation for the single market, the Union has adopted a series of laws liberalizing the main modes of transport: road, rail, sea and inland waterway. More progress has been made in creating an integrated EU transport policy in the past five years than in the previous 30. Union legislation now exists for all modes of transport, creating new open-market conditions. The benefits for Union companies and citizens have been immediate. The Union supported major projects like the EU's high-speed train system, the Channel tunnel, the modernization of Europe's air-traffic control.

The transport sector makes a singular contribution to the well-being of the European Union and its citizens. It ensures the distribution of goods throughout the single market from manufacturer or producer to end-user. It enables people to use their new freedom to move around for professional or for private reasons. Transport gives concrete expression to the abstract concept of the single market. In its own right, transportation is also one of the most important economic activities in the EU accounting for 7% of its gross domestic product (GDP). Its economic impact is even greater when one considers that the manufacture of transport equipment gives jobs to

another 2.5 million people. The importance of an integrated transport structure was recognized by the authors of the Union's founding Treaty of Rome. They set a common transport policy as one of the Union's priority tasks. But progress was slow until 1985 when the Union began to prepare for the single market. Since then, all modes of transport have been forced to loose, if not eliminate, national restrictions against operators from other EU countries. The result has been the creation of a more open European market, free from much red tape and quota restrictions. But more remains to be done both in terms of abolishing residual national restrictions and of integrating national networks across Europe. These need to be re-drawn and upgraded to single trans-European networks. Other priorities for action concern congestion, safety and environmental problems, the unequal utilization of different modes of transport and transport links.

TRANSPORT AND THE ENVIRONMENT

Transport is a major contributor to pollution in the world today. The different forms of transport are the main source of nitrogen dioxide (NO_2) and carbon monoxide (CO), which are major pollutants of the urban environment, and are responsible for a quarter of all emissions of carbon dioxide (CO_2), one of the greenhouse gases. The adverse effects of pollution on human health and the state of buildings are most acute in urban areas where most people live. There are also areas most seriously affected by noise and vibrations. In conjunction with the Member States, the Union intends to develop a global strategy aimed at maintaining mobility while preserving the environment. Obviously, it is for regional and, above all, local government to introduce measures which are effective and command popular support. Foremost among these will be the introduction of vehicles producing fewer or no emissions and the development of rapid, comfortable public transport. The implementation of such policies calls for political will, popular support and substantial investment.

The growth over the past 20 years has been borne unevenly by the different transport modes. Freight transport has gone up by 50% during this time, with road transport accounting for the bulk of the increase. It now accounts for 70% of all

goods transport. Railways carry only 19% and inland waterways 9%. Passenger traffic has nearly doubled in volume since 1970, with most of the increase attributable to the use of private cars. As measured in passenger kilometres, they now account for 79% of all journeys compared with 9% for buses, 7% for rail and 6% for aircraft, although the volume of passenger air traffic quadrupled in the past 20 years. The uneven growth in the utilization of the different transport modes creates problems. Road transport systems are congested or near saturation levels in some regions of the Union. This in turn contributes to environmental problems. In the transport sector, 80% of the CO_2 emissions which contribute to global warming come from road transport. Air travel accounts for 11%, railways for 4% and inland waterways for less than 1%. It is the less polluting modes of transport that are underutilized.

HIGH SPEED TRANSPORT AND THE ENVIRONMENT

Transport is known to be a major contributor to pollution in the world today. The different forms of transport are the main source of nitrogen dioxide (NO_2) and carbon monoxide (CO), which are major pollutants of the urban environment, and are responsible for a quarter of all emissions of carbon dioxide (CO_2), one of the greenhouse gases. There are also areas most seriously affected by noise and vibrations.

Even though the construction of new transport infrastructure may affect the natural environment, major precautions are taken to reduce its impact and it should be emphasised that new high-speed railway lines require considerably less space than a motorway. By way of example, for the first two new lines in Germany 3.2 hectare/km were needed by comparison with the 9.3 hectare/km for West-German motorways. Since electric power lines do not pollute the air, some two-thirds of land used for a new line, lose nothing of their biological qualities. Pollutant emissions are directly dependent on energy consumption.

Scientific research has shown in all cases that railways are less damaging to the environment, a contention which also applies in the case of high-speed trains given

for example that relatively high specific energy consumption of the ICE is around 2.5 litres of fuel per 100 passenger-km, which is only half that of the average car.

Over past decades the railways have successfully managed to reduce train noise. Modern rolling stock is notably quieter than earlier generations. At a speed of 300 km/h the noise level of an Atlantic TGV train set is less than that of a South East TGV at 270 km/h. Extensive research programmes are targeted towards reducing noise levels still further at its source and when there is no other alternative than to route a line near a residential area, noise abatement screens can be installed along the track which, in most cases, will contain the noise within the levels stipulated by the regulations of most European countries. Most lines in Europe, however, can be sited in lightly populated areas. In densely populated areas, in general either existing infrastructure will be used to avoid generating new sources of noise or new lines will be built in covered cuttings or in tunnels.

PLANNED TRANS-EUROPEAN NETWORK (YEAR 2010)

The plan has been drawn up by the European Commission; but it will be up to each Member State to decide the exact routes and the pace of implementation. The prime aim is to connect national networks and to build the necessary motorway link, many of which will be in the outlying regions of the Union. Another important objective, however, is to relieve congestion on the roads. Road users must be made to meet the real traffic costs, for example, by wider application of tolls.

Transport is a growth industry. Transport has increased by over 50% in the past 20 years, largely as a result of the expansion of road traffic. We are nearing saturation point and measures are urgently needed to avert a crisis. Air traffic accounts only 6% of travel, but has had the highest rate of growth of any form of transport in recent years. The main growth factors are: 1) changes in the structure of manufacturing industry with shifts in production locations away from urban areas to new industrial sites. Economic integration within the EU has speeded up the dispersal process; 2) changes in production methods, leading to stock reduction and a requirement for more flexible, varied and rapid delivery systems (known as just-in-time systems). Shipment sizes are reduced but deliveries become more frequent; 3) the growing

importance of the services sector and its multi-site business activities has encouraged rapid growth in professional mobility; 4) the rise in personal incomes and changing demographic patterns have led to a higher degree of car ownership and increased leisure and holiday travel.

Investments in different modes of transport have been uneven too. Two-thirds have gone on road transport although this has scarcely helped the infrastructure cope with growing volumes of traffic. One important reason why road transport has developed at the expense of other modes is because road users have not been confronted with the full cost of their activities. As prices do not reflect the full costs, demand has been artificially high. If appropriate pricing and infrastructure policies were to be applied, the imbalance between modes and the resulting inefficiencies would disappear. The planned EU-wide road tax to charge for the use of motorways by trucks would go part of the way to bring prices in line with costs. The attractiveness of road transport over other modes would diminish.

TOWARDS SUSTAINABLE MOBILITY

The aim of EU transport policy in the 1990s, set out in a landmark White Paper published by the European Commission at the end of 1992, was to achieve a double integration: 1) the integration of modes of transport so that they form integrated systems, combining the use of different modes, where appropriate, on the same journey; 2) the integration of national transport networks into a coherent European network structure.

In addition, the White Paper lays down several social priorities. These concern access to the profession and job training, employment protection and the improvement of living and working conditions. On present forecasts, transport volumes will rise about 30% by the year 2002. In addition, new transport links will be required between the Union and its neighbours in the European Free Trade Association (EFTA) as well as in Central and Eastern Europe. Without the re-alignment of costs and other concrete steps to rebalance capacity among different modes, the ensuring congestion would undermine the single market. The Union and the Member States are already taking action. High-speed train services will shift

some passenger traffic from road and air to railways. High-speed freight services are another priority. The Channel tunnel has, for instance, facilitated freight as well as passenger traffic between Britain and the rest of the EU. The development of combined and "intermodal" transport is another priority. Each mode will be developed and improved so that it meshes better with other modes. At present, combined road/ rail carries only 4% of the total goods transported. Combined transport will target trunk routes which are already near saturation point or where environmental problems occur. Transit across the Alps between the north and south of the Union is one such route. North-south and east-west waterways, like the new link between the Rhine and Danube rivers, also offer new possibilities. Combined transport can also include inland water-ways and even coastal shipping. The basic idea is to use non-polluting and energy-efficient modes for the main part of journeys wherever possible. In this way, a coherent intermodal policy would be developed using the most appropriate mode or combination of road, rail and waterways, and taking account of cost and efficiency as well as environmental and safety considerations.

SUSTAINABLE FUNDING FOR THE EUROPEAN ECONOMY

The trans-European high speed rail network spanning the entire continent as far as the frontiers of the former USSR consists of 35 000 km of high-speed lines, 20 000 km of which are new lines. For the European Union in its configuration at the beginning of 1994 and the Alpine countries, this cost is about 200 billion Ecu for 23 000 km of high-speed lines, 12 000 km which are new lines. This is admittedly a substantial sum in absolute terms, but on the scale of the continent, completion of this network within 20 years, 20% of which is already under way in the West, requires annual outlay in infrastructure investment of only 0.1% of the gross domestic product of the countries concerned. The European Council has realised the importance of this network not solely for the long-term development of the European Union, but also for short-term economic recovery. It approved an action plan for trans-European networks and initial indicative list of 26 projects of European interest. High speed rail was one of the priorities on this list, since nine of the 26 projects on the subject were

approved accounting for 60% of the above-mentioned amount. The EU authorities have thereby demonstrated exemplary resolve to achieve the European high-speed network and to allocate available financial resources in a judicious combination from both the public purse and financial markets.

The results of the railways already involved in the high speed rail sector are spectacular. Through vast improvements in quality, the railways have acquired substantial numbers of additional customers. Train load factors are reaching remarkable levels and demonstrating the attraction for the customer of this unique combination of speed, comfort, safety and the convenience of travel. Overall, high speed rail traffic already represents over 10% of total rail traffic in western Europe. However impressive this figure may be, it should nonetheless be compared with the situation in Japan, where high speed traffic is almost 2 times greater for a population a third of the size. Even taken into account the disparities in geographical and demographic characteristics, this figure gives a measure of the distance still to be covered in Europe and underlines the need to speed up network realisation as much as possible. The development of European high-speed rail services clearly illustrates the pace with which the system has progressed in the early nineties.

HIGH SPEED RAIL : A MAJOR STRATEGY OPTION

The decision to develop a network of high speed trains is of major strategic importance for railways across Europe. The pace with which services have developed and their success with customers have transformed high speeds into a timely response to market requirements and foreseeable trends on this market. After initial developments, the scope of the field on which thinking has focussed has broadened with the political and economic opening of central and eastern European countries, which has paved the way for discussions into creation of a cohesive network to meet the needs of the continent as a whole in the medium and long-term future. Through the development of high speed rail services, the European railways are radically improving their product range and are increasing their market share substantially, to the greater benefit of their economic results. There is also a political determination to promote the development of rail transport as one means of providing Europe’s

population with sustainable mobility compatible with the constraints of environmental conservation.

Generally speaking, high speed is taken to refer to rail passenger services operating at speeds above 200 km/h. However, other products may also be incorporated in the high speed rail package. One essential factor is the spectacular progress achieved through the introduction of a new generation of rolling stock, boosting speeds and yielding substantial cuts in journey times in far more convenient travel conditions than by air. Indeed, the launch of high speed rail services generally requires new lines specially designed for this type of traffic to be commissioned or major upgrading of existing lines. The European high speed network currently emerging includes new lines built specially with high speed traffic in mind, upgraded lines adapted to speeds of 200-250 km/h and connecting lines worked at lower speeds. It was in the sixties that high speed rail projects began to take shape, first in Japan, then in Europe. The first European projects were developed for priority routes at national level, like the Rome-Florence "Direttissima" in Italy or the new TGV Paris-Lyons line in France. But the fundamentally new international potential of high speed rail soon became clear. High speed trains can offer attractive products for journeys of up to 1,200 km in day traffic and up to 2,500 km for overnight travel. And in Europe, many intercity links fall into this bracket.

THE EUROPEAN NETWORK TAKES SHAPE

Over recent years, the commissioning of several lines, new or upgraded for high speeds, and the progressive extension of services have laid the ground for substantial developments in services and have attracted new types of customer to the rail mode. As a direct result of the launch of high speed rail services or improvements to existing high speed trains, rail's market share has risen extremely significantly. Furthermore, the new lines which are being progressively commissioned also represent the basic components of the future European network and will assume their full value once the necessary interconnections have been completed. The progressive integration of this network on an international level gives European railway

companies the means to craft a commercial service of the highest quality, particularly attractive on the passenger transport market.

Train/plane synergies are set to play a key role in the development of the European passenger transport market. Over short distances, high speed trains are in direct competition with planes. The launch of new rail services can lead to a reduction in the number of short-haul flights, releasing capacity for use by the airlines on other routes. The advantages of the train when compared with planes are especially strong when travel times lie below 3 hours and distances under 800 km/h, but rail-air complementarity really starts to come into its own when the rail journey section is combined with a medium or long-haul flight. The adopted legislation allowing international groups to use the rail infrastructure to operate international services applies particularly to operate of combined transport systems (road/ rail or sea/ rail). At the moment most of the cars transported by train are brand new, but one of the objectives of European transport policy is to develop combined road-rail transport, i.e. loading lorries and cars on to trains on particularly scenic stretches of the route. This form of transport saves energy, reduces carbon dioxide emissions and spares the environment, while allowing drivers to enjoy the use of their cars at their destination. But only 4% of freight is currently carried by combined road-rail transport in the Union. Interconnections between rail and airport already exist in Frankfurt, Zurich, Geneva, Amsterdam and will soon be available at Paris-Charles de Gaulle. Over the years, new stations will also provide passengers with very convenient connections between high speed trains and planes at Lyons-Satolas, Copenhagen and Frankfurt.

HIGH SPEED RAIL IN GERMANY AND SCANDINAVIA

In Germany, high speed operations started in 1991 with the launch of the InterCity Express Trains (ICE) and the Mannheim-Stuttgart and Hanover-Wurzburg new lines. ICE services, which are phased with InterCity IC trains, form a mesh of regular-interval services well suited to German urban geography. ICEs have also been serving Berlin, bringing the German capital into the system. ICE services also cross the Swiss border to provide international through services such as Zurich-

Frankfurt. The development of the German network is obviously of the utmost importance from a European point of view, whether it be Cologne-Rhine/Main, Hanover-Berlin or Karlsruhe-Basle. Implementation of these projects is vital both to release necessary capacity on particularly congested traffic corridors and for international transit along the North-South routes like Scandinavia-Switzerland-Austria-Italy or East-West between Benelux and the Paris basin towards Scandinavia, Poland, the Czech Republic, Austria, Hungary and South-Eastern Europe. Journey times between Hanover and Berlin is cut to 1 hour 45 minutes once this line becomes operational. For German domestic traffic, the Cologne-Rhine/Main new line will be of paramount importance in that it will link several particularly important urban centres from the year 2000. It will also be used by international services, for example Brussels-Frankfurt or Amsterdam-Basle. Lastly, another line where upgrading work is scheduled for completion around the 2000 time horizon is Leipzig-Nurenberg-Munich which will form a major part of a central European North-South link.

The projects aimed at connecting Scandinavia to cross the straits separating it from the rest of Europe include the construction of major combined tunnel-bridge infrastructure. Following the inauguration in the next two years of the Danish rail link across the Great Belt, the upgrading of the Hamburg-Copenhagen line will imply the construction of another over the Fehmarn Belt. The fixed link between Copenhagen and Malmo which is currently at an advanced stage of discussion between the Danish and Swedish authorities is also, of course, an essential part of the mechanism and will lock Kastrup airport in Copenhagen into the future international high-speed link to ensure intermodality.

HIGH SPEED RAIL IN ITALY AND SPAIN

In Italy, high speed traffic has branched outwards from the Rome-Florence "Direttissima" line, 262 km long and running along the backbone of the peninsula. Passenger services are worked by ETR 450-type train-sets running at the current maximum speed of 250 km/h. Since 1988, these trains have been operated not just on the "Direttissima" line but also to Genoa, Milan, Venice, Turin, Bari and Naples. By the year 2000, it was planned to open the Turin-Milan-Bologna-Florence and Rome-

Naples new lines to traffic, making a major corridor with a total length of 898 km including the section already in use. Planning, funding and execution of these high speed projects is the task of a specially-created company, Treno Alta Velocita (TAV), 40% of whose capital is held by Italian railways with the remaining 60% made up of private capital, in an interesting and innovatory form of public-private partnership. The trans-Alpine link between Lyons and Turin will join the French and Italian networks. The importance of this line for international traffic goes without saying since it connects major cities like Rome, Venice, Milan and Turin to Lyons, Marseilles, Barcelona, Valencia, Madrid and of course Paris. In addition to Lyons-Turin, a number of further trans-Alpine links (Basle-Milan via the Gotthard pass, Munich-Verona via the Brenner and Vienna-Venice via the Tarvisio) will have an important role to play in creating the transport capacity necessary for both freight and passenger traffic across the Alps and will thus put the end to Italy's isolation on the other side of the Alpine barrier.

The high speed era in Spain began on 21 April 1992 with the launch of the AVE on the 471-km new line between Madrid and Seville. Unlike the rest of the Spanish network, this line was built to the international gauge of 1,435 mm, as a result of which all the high speed lines built in Europe to date have the same gauge, thereby opening the way for future interconnections with the Iberian Peninsula. The next step was the construction of a new line between Madrid and Barcelona and the French border. A link-up to the new line on the French side connecting the border to Perpignan and Montpellier and the interconnection to be established with the South-East TGV will then enable the Spanish network to be fully integrated with Europe. Another link across the Basque country will be established later to connect with the French high-speed network in Bordeaux.

RAILWAYS AND COMPETITION

Planned as money-making enterprises, many early railroads were notably successful financially. In recent years, however, the picture has been much different. The development of the internal-combustion engine and its application to highway vehicles and the invention of the airplane had far-reaching effects on railroad

transportation. Railroads have appeared in the situation of grim economic war for clients. In freight, considerable success has resulted from the "marketing approach", wherein railroads closely tailor their rates, services, and equipment to the particular needs of specific shippers. Typical are the "unit" or "block" trains operated for shippers of bulk commodities, such as coal, oil, ore, and grain. They operate as a unit on fast schedules between one origin and one destination, bypassing all intermediate yards and terminals en route. With faster operation and larger cars, these trains are so productive that they permit the railroads to offer greatly reduced rates. Another way in which railroads have responded to new competition is to offer shippers many special types of freight cars designed to load particular commodities quickly and at minimum cost, such as the tri-level auto-rack car, the 10,000-cubic foot box-car, and 100-ton covered hopper cars and gondolas. Another significant competitive development was piggy-back and containerized services. The piggy-back idea, which actually dates from the 19th century, combines the flexibility of truck pickup and delivery with the economy of rail movement between cities. Along with piggyback development has come increasing interest among railroads (as well as other modes of transport) in container systems, by which merchandise could be loaded into large standard containers or boxes that could move via highway on a truck chassis, via rail on special container cars, in ships especially equipped to handle them, or even by air. A single shipment might use two or more modes of transport in the course of its trip. In Europe special TEEM (Trans-Europ Express Merchandise) trains operate between major points, carrying only containers. In Britain, fast container shuttle trains now operate between about two dozen main cities and ports. This Freightliner system has been highly successful and is said to be competitive with over-the-road trucking, even over relatively short distances. Canadian and Japanese railroads also have extensive container operations, mainly for import-export traffic.

RAILWAYS : STATE OR PRIVATE?

Although most of the early railroads were built and operated as private, profit-making businesses, railroads soon came under relatively intense public scrutiny and regulation. This was probably inevitable because of the far-reaching influence

railroads quickly developed over the life and the commercial activities of the communities and countries they served. The history of regulation followed the same path with minor variations in all countries, beginning with regulation of railroad construction – that is, deciding whether to permit a new line to be built and approving its location – the government took an increasing interest in details of operation, especially in connection with safety. Railway acts were passed in country after country prescribing signal modes, brakes, track standards, employee training, and other aspects of railroad operation. At the same time, governments took an increasing interest in the financial side of railroads, regulating rates and fares and exercising licensing power over mergers and other financial operations. Degree of public regulation varied, but by the early 1970s in nearly every country in the world, with the notable exception of the United States, regulation had evolved into public ownership and operation. This resulted from the railroad's increasing financial difficulties in the course of the 20th century. Competition from other modes increased sharply after World War II for many of the world's railroads. Because of governmental and labour union restrictions as well as the large investment required in railroad fixed plant, it was difficult for the railroads to adjust their operations to changing conditions. Thus, the solution has been to nationalize the railroad – to have the government provide the service. While nationalization preserves services felt to be essential, it does not obviate the need for railroads to change, improve, and compete. Nowadays, railway management faces two ways of further development. The first one is to preserve the nationalized state of railways investing huge funds into technological innovations, the other one is to create joint-stock companies with private capital or to privatize railways completely. This assists railways in competing with other modes of transport, proposing faster, more flexible and cheaper services. They begin to fight back against their competitors with considerable success.

MODERN PROBLEMS FACING RAILROADS

The railroad industry can look back over a proud history. Railroads were a vital element in the Industrial Revolution. They helped make Britain an industrial power, played similar roles in countries such as France and Germany, and went on to do

much the same in Russia and Japan. Railroads almost literally built the United States and Canada; and they remained the economic backbone of most of the major world powers. But as the last third of the 20th century began, the railroads in a number of countries, most notable Britain and the United States, were in serious trouble. The railroad's share of the total transportation business was dropping steadily. The railroads in most countries had long since come under state control, and the remaining privately owned lines were finding it difficult to operate at a profit. Some observers believed the end of railroading was in sight. Technology was evolving so rapidly that it was impossible to say, as of the early 1970s, that this could not happen, but it seemed unlikely. It was becoming clear, however, that the railroad of the future would have a different role to play than in the past. For more than a century the railroad was the dominant form of land transportation in much of the world. It was, and remains, the one land carrier that can carry almost anything, anywhere the tracks go, and do it at a true cost lower than other types of land-air transportation.

Today, other modes of transportation have been developed to the point where they can do certain transportation jobs more effectively than the railroads. Pipelines can carry liquids and some solids over long distances economically. Airplanes, with their great speed, can carry some types of light, valuable freight at a saving, and trucks offer speed and flexibility, especially for the shorter hauls. The private automobile, operating over modern highways, and the airplane have taken over much passenger traffic formerly handled on rails. The motorbus is an effective competitor for the short- to medium-distance passenger business. The modern barge, operating on improved inland waterways systems, can move many commodities over specific routes at very low cost. The development of these newer modes, therefore, has changed the role of the railroad from that of the general-purpose earner to that of a more specialized earner, just as other modes are specialized.

FUTURE ROLE OF RAILROAD

The future role of the railroad as a specialized carrier will vary in different nations in general, however, the railroad is particularly strong in a number of areas. First of all, it is especially effective in moving large volumes of bulk commodities,

such as coal, ores, chemicals, and grain, over relatively long distances. It can also move large volumes of finished merchandise economically at relatively high speeds over long distances. The railroad can effectively handle containers in large volumes between major centres, and in some countries, trucks on “piggyback” trains. An efficient railroad container or piggyback shuttle system can be viable even over relatively short distances. The railroad is the best mode for moving large numbers of commuters between big metropolitan centres and the outlying suburban areas. Very high-speed intercity passenger services can be successful when operated with modern equipment at distances up to 300 miles. In short, the railroad is a high-volume, medium- and long-distance carrier of both passengers and freight.

In looking at the future place of railroads, three other factors should be noted, too. A railroad disturbs the natural environment far less than a highway or an air-transport system. It also produces less pollutants per unit of transportation performed than either highway or air transportation. These factors should become more significant as society increasingly concerns itself with the need to preserve the environment and to reduce air, water, and noise pollution. A railroad is far more efficient in its use of fuel than either highway or air transportation is. It is probable that future concern over the best use of these resources will produce more emphasis on rail transportation. While much public money has gone into technological research of the newer forms of transportation and into constructing facilities for them, relatively little has been spent to improve railroad technology. Thus, even the most advanced of today’s railroad plants and services, with few exceptions, do not represent anything like the best that is possible from the railroad. As an example, experiments are going on working out tracked passenger vehicles which can go much faster than conventional trains. The idea is that the practical upper limit of speed for flanged-wheel railroad vehicles might be in the range of 150 to 200 miles (240 to 320 km) per hour.

SELF-TRAINING ASSIGNMENTS

I. Matching the translation properly

1. У майбутньому локомотивами будуть керувати комп'ютери.

A. In the future the locomotives will run the computers.
B. Locomotives will be run by computers everywhere.
C. Everywhere locomotives were run by computers.
D. In the future the locomotives will be run by computers.

2. Британія першою упровадила парову тягу на залізниці.

A. Great Britain was the last to introduce steam traction on railways.
B. Great Britain was the first to introduce steam traction on railways.
C. Great Britain and the USA were the first to introduce steam traction on railways.
D. Great Britain was the first to introduce electric traction on railways.

3. З того часу багато змін відбулося на залізниці.

A. Since those times many changes have taken place on railways.
B. Since that time many changes have taken place not only on railways.
C. Since that time many changes have taken place on railways.
D. Since that time many changes will have taken place on railways.

4. Але одного дня рейка зламалася і поїзд перекинувся.

A. But one day the rails broke and the trains overturned.
B. But one day the rail broke and the train overturned.
C. But one night the rail broke and the train overturned.
D. But one day the rail will break and the train will overturn.

5. Його виготовляють на локомотиво-будівному заводі.

A. It is made at the locomotive-building works.
B. It isn't made at the locomotive-building works.
C. They are made at the locomotive-building works.
D. It was made at the locomotive-building works.

6. На перших залізницях коней використовували для приведення у дію поїздів.

A. Horse was used on the first railway for drawing trains.
B. Horses will be used on the fast railways for drawing trains.
C. Horses were used on the last railways for drawing trains.
D. Horses were used on the first railways for drawing trains.

7. Багато змін відбудеться в майбутньому на залізниці.

A. Many changes in the future will be made on the railways.
B. Many changes in the past were made on the railways.
C. Many changes in the future will be made in the world.
D. Many changes in the future will be made in the transportation system.

8. Залізниця використовується для перевезення пасажирів і вантажів.

A. Railways were used to carry passengers and freight.
B. Railways are used to carry passengers and freight.
C. Railways are used to carry passengers, not freight.
D. Railways are used to carry passengers' freight.

9. Це важливо для економічного розвитку країни.

A. It is important for the economy's development of a country.
B. It was important for the economic development of a country.
C. It isn't important for the economic development of a country.
D. It is important for the economic development of a country.

10. Експрес поїзди відомі як «швидкісні поїзди».

A. Express trains are thought as „fast trains".
B. Express trains are spoken as „fast trains".
C. Express trains are known as „fast trains".
D. Express trains are known as last trains.

Key: 1 d, 2 b, 3 c, 4 b, 5 a, 6 d, 7 a, 8 b, 9 d, 10 c

II. Matching the translation properly

1. Взагалі ми вважаємо залізницю засобом пересування.

A. We usually think of railways as a means of travel.
B. We usually read of railways as a means of travel.
C. We usually speak of railways as a means of travel.
D. He usually thinks of railways as a means of travel.

2. Кінні залізниці проіснували не довго.

A. The horse-railways lasted long.
B. The horse-railways didn't last long.
C. The horse-railways won't last long.
D. The horse-railways couldn't last long.

3. Одна з перших спроб використати паровий двигун була зроблена в 1808.

A. One of the last attempts to use the steam engine was made in 1808.
B. One of the first attempts to use the steam engine was made in 1880.
C. One of the first attempts to use the steam engine was made in 1808.
D. One of the first attempts to use the electric engine was made in 1880.

4. За шилінг публіка могла проїхати в вагоні, що приводився в дію паровим двигуном.
A. For a shilling the public could travel in carriage drawn by the diesel engine.
B. For two shillings the public could travel in carriage drawn by the steam engine.
C. For a shilling the public had to travel in carriage drawn by the steam engine.
D. For a shilling the public could travel in carriage drawn by the steam engine.

5. У них були сумніви в можливості використання парового двигуна взимку.

A. They have doubts about the possibility of using steam engines in winter.
B. They had difficulties with using steam engines in winter.
C. They had doubts about the possibility of using steam engines in winter.
D. They had plans about the possibility of using steam engines in winter.

6. Велика кількість розробок буде впроваджена.

A. Great numbers of development will be introduced.
B. A greater number of developments will be introduced.
C. The greatest number of developments will be introduced.
D. A great number of developments will be introduced.

7. Люди могли наздогнати локомотив Тревітіка.

A. People couldn't catch Trevithick's locomotive.
B. People had to catch Trevithick's locomotive.
C. People could catch Trevithick on his locomotive.
D. People could catch Trevithick's locomotive.

8. «Ракета»могла рухати маленький потяг із навантаженими вагонами.

A. „The Rocket" could draw a small train of loaded cars.
B. „The Rocket" could draw a huge train of loaded cars.
C. „The Rocket" could draw two small trains of loaded cars.
D. „The Rocket" had to draw a small train of loaded cars.

9. У майбутньому локомотивами будуть керувати комп'ютери.

A. In the future the locomotives will be run by computers.
B. In the future every locomotive will be run by computers.
C. In the future the locomotives will be run by general computer.
D. In the future the locomotives will be run with computers.

10. Про впровадження електричної тяги на залізниці говорили ще в XIX сторіччі.

A. The introduction of steam traction on railways was spoken of in the XIX century.
B. The introduction of electric traction on railways was spoken of in the XX century.
C. The introduction of electric traction on railways was spoken of in the XIX century.
D. The introduction of diesel traction on railways was spoken of in the XIX century.

Key: 1 a, 2 b, 3 c, 4 d, 5 c, 6 b, 7 d, 8 a, 9 a, 10 c

III. Matching the translation properly

1. Черепанови сконструювали перший паровоз у Російській імперії.

A. The Cherepanovs constructed the flying steam locomotive in the Russian Empire.
B. The Cherepanovs constructed the fastest steam locomotive in the Russian Empire.
C. The Cherepanovs constructed the first steam locomotive in the Romanian Empire.

D. The Cherepanovs constructed the first steam locomotive in the Russian Empire.

2. Цей локомотив тепер демонструється у музеї.

A. These locomotives now are demonstrated in a museum.
B. This locomotive now is demonstrated in a museum.
C. This locomotive was demonstrated in a museum.
D. This locomotive now is demonstrated as a monument.

3. Залізниці відіграють дуже важливу роль у вантажних перевезеннях.

A. Railways play a very important part in the transportation of passengers.
B. Railways play a very important part in the transportation of freight.
C. Railways play a very important part transportating freight.
D. Railways played a very important part in the transportation of freight.

4. Конструктори й самі не очікували задовільного результату.

A. The designers themselves didn't expect satisfactory result.
B. The designer himself didn't expect satisfactory result.
C. The designers themselves didn't believe in satisfactory result.
D. The designers themselves didn't expect such good result.

5. Новий метод фарбування вагонів виявився успішним.

A. The new method of painting cars is successful.
B. The new methods of painting cars proved successful.
C. The new method of painting cars proved successful.
D. The new method of repairing cars proved successful.

6. Конференцію відвідають залізничні експерти з різних країн.

A. The conference will be attended by railway experts from various countries.
B. The conference was attended by railway experts from various countries.
C. This conference is often attended by railway experts from various countries.
D. The conference would be attended by railway experts from various countries.

7. Парові залізниці використовували силу пари для руху поїздів.

A. Steam railroads used the power of steam for stopping trains.
B. Steam railroads used the power of steam for drawing trains.
C. Steam railroads used steam traction for drawing trains.
D. Steam railroads using the power of steam for drawing train are very rare today.

8. Він розвивав нечувану швидкість – 13 миль/год.

A. It developed an unthought-of speed of 13 mph.
B. It developed an incredible speed of 13 mph.
C. It developed an unheard-of speed of 13 mph.
D. It developed a very high speed of 13 mph.

9. Це була коротка лінія, що покривала відстань усього 854 метри.

A. It is a short distance line covering only 854 metres.
B. It was a short distance line covering only 864 metres.
C. It was a short distance line covering only 854 metres.
D. It was a short distance line covering only 854 kilometres.

10. Нас повідомлять про зміну в розкладі.

A. We were told about the change in the time-tables.
B. They'll be told about the change in the time-table.
C. We were told about the changes in the time-tables.
D. We'll be told about the change in the time-table.

Key: 1 d, 2 b, 3 b, 4 a, 5 c, 6 a, 7 b, 8 c, 9 c, 10 d

IV. Matching the translation properly

1. На ці експериментальні дані можна покластися.

A. This experimental datum can be relied upon.
B. These experimental data can be relied upon.
C. These experiments can be relied upon.
D. These experimental data can be discussed.

2. Про такий винахід навіть не думали раніше.

A. About such invention it wasn't thought before.
B. Such invention was not seen before.
C. Such inventions weren't thought of before.
D. Such invention was not thought of before.

3. Залізниці дуже важливі для економічного розвитку країни.

A. The railways were very important for the economic development of the country.
B. The railways are very needed for the economic development of the country.
C. The railways are very important for the economic development of the country.
D. The railways are very important for the economy of the country.

4. Високі швидкості розвиваються сучасними потягами.

A. High speeds are developed by modern trains.
B. Higher speeds are developed by modern trains.
C. The highest speeds are developed by modern trains.
D. High speeds were developed by modern trains.

5. Конференцію відвідають експерти з різних країн.

A. The conference will be attended by experts from various countries.
B. The conference will be attended by experts from our country.
C. The conference was attended by experts from different countries.
D. The conference is always attended by experts from various countries.

6. Багато з них боялися залізниць, коли ті вперше з'явилися.

A. Many of us were afraid of the railways when they first appeared.
B. Many of them were afraid of the railways when they first appeared.
C. Many of them were afraid of the railways when they first travelled.
D. Many of them were afraid of the locomotives when they first appeared.

7. На економіку країни впливає транспорт.

A. The economy of the country is always influenced by transport.
B. The economies of the countries are influenced by transport.
C. The economy of the country is influenced by transport.
D. The economy of the country influenced on transport.

8. Про важливість залізниць для економіки країни багато пишуть.

A. The importance of railways for the economy of a country is much spoken about.
B. The importance of railways for the economy of a country is much discussed.
C. The importance of railways for the economy of a country is immeasurable.
D. The importance of railways for the economy of a country is much written about.

9. На програмі наполягали багато фахівців.

A. That program was insisted on by many specialists.
B. The program was inspected by many specialists.
C. The program was insisted on by many specialists.
D. The program is insisted on by many specialists.

10. Проти одного з проектів заперечували.

A. One of the projects is objected to.
B. One of the projects was objected to.
C. One of the projects will be objected to.
D. The project is objected to.

Key: 1 b, 2 d, 3 c, 4 a, 5 a, 6 b, 7 c, 8 d, 9 c, 10 b

V. Matching the translation properly

1. Перший паровоз цього типу був всього 15 футів завдовжки.

A. The first steam locomotive of this type was only 15 feet in length.
B. The first locomotive of this type was only 15 feet in length.
C. The next steam locomotive of this type was only 15 feet in length.
D. The first steam locomotive of this type was only 15 km in length.

2. Чому проекти незвичайних залізниць можуть бути для нас важливими?

A. Why may the projects of unusual railways be important for us?
B. May the projects of unusual railways be important for us?
C. When may the projects of unusual railways be important for us?
D. Where may the projects of unusual railways be important for us?

3. Яку енергію треба використати згідно з проектом для замороження води?

A. What power must be used for freezing water?
B. What power has to be used for freezing water?
C. What power is to be used for freezing water?
D. What power was to be used for freezing water?

4. На відміну від сучасних локомотивів, цей мав тільки два колеса.

A. Unlike modern locomotive this one had only two wheels.
B. Unlike modern locomotives these had only two wheels.
C. Unlike modern locomotives this one had no wheels.
D. Unlike modern locomotives this one had only two wheels.

5. Конструктор планував, що він закінчить своє дослідження за тиждень.

A. The designers planned that they would complete their research in a week.
B. The designer planned that he would complete his research in a week.
C. The designer plans that he will complete his research in a week.
D. The designer planned that he would complete his research in two weeks.

6. Більшість фахівців уважає, що потягами майбутнього керуватимуть автомати-машиністи.
A. Specialists believe the trains of the future would be operated by automatic drivers.
B. Most specialists believed the trains would be operated by automatic drivers.
C. Most specialists believe the trains of the future would be operated by automatic drivers.
D. Many specialists believe the trains of the future would be operated by automatic drivers.

7. Усі магістралі повинні обслуговуватися швидкісними потягами.

A. All main lines should be serviced by high-speed trains.
B. All lines should be serviced by high-speed trains.
C. Any main line should be serviced by high-speed trains.
D. All main lines should be serviced by low-speed trains.

8. Цей експеримент має на меті досягнення рекордної швидкості пробігу.

A. This experiment is aimed at reaching a record speed.
B. These experiments are aimed at reaching a record speed of running.
C. This experiment was aimed at reaching a record speed of running.
D. This experiment is aimed at reaching a record speed of running.

9. Якщо мотор не ефективний, втрати енергії дуже великі.

A. If the engines are not efficient, the losses of energy are very large.
B. If the engine is not efficient, the losses of energy are very large.
C. If the engine were not efficient, the losses of energy would be large.
D. If the engine is not efficient, the losses of energy will be large.

10. На електровозах електричний струм використовують як джерело енергії.

A. On the electronic locomotives electricity is used as a source of energy.
B. On the electric locomotives electricity is used as a source of traction.
C. On the electric locomotives electricity will be used as a source of energy.
D. On the electric locomotives electricity is used as a source of energy.

Key: 1 a, 2 a, 3 c, 4 d, 5 b, 6 c, 7 a, 8 d, 9 b, 10 d

VI. Matching the translation properly

1. Залізниці, що колись уважалися непрактичними, стали невід'ємною частиною нашого життя.

A. The railways themselves once regarded as impracticable have become the integral part of our life.
B. The railways regarded as impracticable become the integral part of our life.
C. The railways themselves once regarded as impracticable became the integral part of our life.
D. The railways regarded as impracticable have become the part of our life.

2. Саме збільшена вага примушувала вагон «збігати» знову вниз.

A. It was the weight that made the car run down again.
B. It was the large weight that made the car run down again.
C. It was the increased weight that made the car run down again.
D. It was the decreased weight that made the car run down again.

3. Незвичайні залізниці цікаві з різних точок зору.

A. The unusual railways are different.
B. The usual railways are of interest from different points of view.
C. The unusual railways are of interest from all the points of view.
D. The unusual railways are of interest from different points of view.

4. Електроенергія передається метропоїздам за допомогою контактної рейки.

A. Electric energy is transferred to metro trains by means of the third rail.
B. Electric energy is transferred to metro trains by means of the rails.
C. Energy is transferred to metro trains by means of the third rail.
D. Electric energy is transferred to trains by means of the third rail.

5. Одноколійки з найінтенсивнішим рухом слід перебудувати в двоколійки.

A. The heavily-used single-track lines should be double-tracked.
B. The most heavily-used single-track lines should be double-tracked.
C. The most heavily-used main lines should be double-tracked.
D. The most heavily-used double-tracked lines should be single-track.

6. Частіше обслуговування слід упроваджувати в години пік.

A. Faster service ought to be introduced at peak hours.
B. Fast service ought to be introduced at peak hours.
C. More service ought to be introduced at peak hours.
D. More frequent service ought to be introduced at peak hours.

7. Учені не були впевнені, чи може новий пристрій збільшити ефективність двигуна.

A. The scientists were sure the new device could increase the efficiency of the engine.
B. The scientists were not sure whether the new device could increase the efficiency of the engine.
C. The scientists were not sure whether the new device would increase the efficiency of the engine.
D. The scientists are sure whether the new device increase the efficiency of the engine.

8. План потребує детального обговорення.

A. The plan requires to be discussed in detail.
B. The plan required to be discussed in detail.
C. The plans require to be discussed in detail.
D. The plans required to be discussed in detail.

9. Після пробігу-випробування повідомили, що потяги йшли з середньою швидкістю 96 м/год на експериментальній ділянці.
A. After the test the trains had averaged 96 mph on the experimental section.
B. After the run it was reported the trains had averaged 96 mph on the section.
C. After the test run it was reported the trains had averaged 96 mph on the experimental section.
D. After the test run it was reported the trains averaged 96 mph on the experimental section.

10. Дивна гірська залізниця в Австрії привернула увагу багатьох фахівців.

A. The strange mountain railway in Austria attracted the attention of specialists.
B. The strange mountain's railways in Austria attracted the attention of many specialists.
C. The strange mountain railway in Austria attracted the attention of many specialists.
D. The strange mountain railways in Austria attract the attention of many specialists.

Key: 1 a, 2 c, 3 d, 4 a, 5 c, 6 d, 7 b, 8 a, 9 c, 10 c

VII. Matching the translation properly

1. На ці експериментальні дані можна покластися.

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A. If the engines are not efficient, the losses of energy are very large.
B. If the engine is not efficient, the losses of energy are very large.
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A. The economy of the country is always influenced by transport.
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D. The project is objected to.
Key: 1 b, 2 d, 3 d, 4 d, 5 a, 6 a, 7 c, 8 d, 9 c, 10 b

GETTING PREPARED FOR CREDIT-TEST № 1

Translate into English applying the proper means of expression of different linguistic phenomena

1. Залізниці сьогодні не були б такими популярними, якби їх швидкість не збільшувалась. Надвисокі швидкості, однак, йдуть пліч опліч із безпекою. Дійсно, жоден пасажир не наважився б користуватися залізницею, якби залізниця не змогла б забезпечити безпеку подорожі. Безпека залежить від багатьох факторів. У першу чергу вона визначається станом колії. Вагони для тестування колії переміщаються повільно вздовж лінії та показують інженерові, де потрібно відремонтувати колію, а велика кількість колійної техніки приводить її до належного стану. Обговорюючи безпеку на залізниці, слід також звернути увагу на ефективні гальмівні системи. Іншим аспектом залізничної безпеки є проблема сигналізації. Необхідність у сигналізації виникла тоді, коли кількість поїздів збільшилася і стало необхідно керувати рухом тим чи іншим шляхом. Одним із методів контролю за рухом поїздів є «Централізований контроль за рухом» чи ЦКР. (*912 др.зн.*)

2. Одна з Лондонських підземних залізниць – лінія Вікторії – була введена в експлуатацію у 1968 році. Характерною рисою цієї лінії є автоматично керовані поїзди та автоматична перевірка білетів. Лінія обслуговується восьми-вагонними поїздами, які керуються автоматично за допомогою кодованих сигналів, що отримуються через ходові рейки. Спеціальні пристрої, установлені в передній частині поїздів, приймають («підбирають») ці сигнали, встановлюють швидкість поїздів або зупиняють поїзд у разі будь-якої нагальної потреби. Кожний поїзд «використовує» одного оператора, який повинен лише відчиняти та закривати двері на станціях. Якщо трапляється якесь ушкодження, він може вести поїзд у звичайному режимі. Завдяки автоматичному обладнанню забезпечується мінімальна відстань між поїздами. Численні електронні пристрої розроблені, щоб керувати цілою системою та уникати

будь-якої аварійної ситуації, що може призвести до серйозного нещасного випадку. (*943 др.зн.*)

3. Японія – це видовжена острівна країна, що простягається із півночі на південь, із численними горами, які досягають 1000 м над рівнем моря. Рівнина займає приблизно 16 відсотків від загальної площі країни. Не дивно, що ці території є найбільш населеними територіями. Більшість головних міст і великих промислових центрів розташовані в цих частинах країни. Японська національна залізниця складається із мережі поздовжніх магістральних ліній, які проходять через міські райони і промислові регіони, а другорядні лінії перетинають магістральні лінії у декількох точках. Іншою характерною особливістю залізниць Японії є те, що вони є об'єктом уваги при будівництві громадських споруд. Тобто, топографічні умови країни вимагають зведення великої кількості інженерних споруд, таких як мости та тунелі. Часті землетруси і тайфуни також потрібно взяти до уваги. Якби мости, тунелі і будівлі були звичайної конструкції, вони б не могли витримати сильних вітрів і землетрусів. (*965 др.зн*.)

4. Транспорт є невід'ємною, дуже важливою частиною виробничо-господарського комплексу країни. Транспорт як галузь матеріального виробництва має свої особливості: 1) транспорт є продовженням процесу виробництва в сфері обігу (сам він не створює нового продукту, тільки переміщує продукцію, створену іншими галузями народного господарства, але без цього переміщення процес виробництва не можна вважати закінченим); 2) продукція транспорту створюється і споживається в процесі переміщення вантажів і людей, тому вона не може накопичуватись і запасатись; 3) транспорт є важливою умовою зростання економічної ефективності суспільного виробництва, оскільки без нього не можливе кооперування і спеціалізація, які підвищують продуктивність праці; 4) завдяки транспорту здійснюється процес територіальної спеціалізації; 5) транспорт має дуже велике оборонне значення.

Не тільки за своєю роллю, а й за потужністю матеріально-технічної бази транспорт посідає значне місце в сфері матеріального виробництва. (*993 др.зн.*)

5. Китайський надшвидкісний «поїзд-куля» рухається увесь час без зупинок. На маршруті від Пекіну до Гуанчжоу – 30 станцій, отже, лише на зупинку та повторне прискорення на кожній станції витрачатиметься як енергія, так і час. Розрахунок у 5 хвилин на кожну станцію (літніх пасажирів не бажано квапити) призведе до загальних втрат у – 5 хв Х 30 станцій – 2,5 години додаткового часу подорожі. Ті, хто сідає на поїзд, на станції входять до «з'єднувальної» кабіни, яку розташовують прямо перед поїздом, що прибуває на станцію (на рівні його даху). Коли поїзд прибуває, він взагалі не зупиняється. Він лише притишує хід, щоб «підібрати» «з'єднувальну» кабіну, яка фіксується на його даху і далі рухається із поїздом. Поки поїзд рухається зі станції, пасажири зі «з'єднувальної» кабіни переходять до поїзда. Після повного «вивантаження» пасажирів «з'єднувальна» кабіна переміщується (горизонтально) в кінець поїзда, щоб пасажири, які виходять на наступній станції, зайшли у кабіну і, таким чином, підготувалися до висадки. (*1007 др.зн.*)

6. З моменту запровадження високошвидкісних залізничних перевезень, поїзди досягли певного прогресу стосовно швидкості та ефективності, та й ключові розробки були здійснені в усіх галузях залізничного транспорту. У 2002 були запроваджені поїзди-напівпричепи, що означає, поїзд може нахилитись, коли він проходить на поворотах. Цей новий тип поїзда дозволяє рухатись набагато швидше, без необхідності будувати нові колії. З 2004 року компанія *Virgin Trains* використовує поїзди *Pendolino* з нахилом кузову, який може розвивати швидкість до 125 миль на годину на деяких своїх маршрутах. *Maglev* – це типи поїздів, які не мають коліс. Замість цього вони ніби тримаються на поверхні колії. *Maglev* (Маглев) – це скорочення від «магнітна левітація», що означає використання магнітів, щоб змусити поїзд піднятись над колією, а отже, вони можуть рухатись швидше. Деякі поїзди *Maglev* уже були в експлуатації у Німеччині та Японії, де поїзди рухаються із неймовірною швидкістю 552 км/год

експериментальною колією. Сподіваються, що поїзди *Maglev* розвиватимуть швидкість до 800 км до 2020 року. (*1077 др.зн.*)

7. Історія залізниць починається у XVIII столітті із прокладання на заводах і копальнях Великої Британії чавунних колійних доріг та з використанням кінної тяги. Після упровадження механічної тяги від парової установки залізничний транспорт почав швидко розвиватись. «Батьком» залізничного транспорту вважають англійського інженера Джорджа Стівенсона, який у 1814 р. побудував перший паровоз, а в 1823 р. разом із сином Робертом заснував перший паровозобудівний завод в Нью-Каслі. Перші паровози були малопотужними, але з часом вони технічно удосконалювались. Поступово удосконалювалась залізнична колія: замість кованих чавунних з'явились прокатні залізні рейки, рейко-шпальна решітка, стикові скріплення, що сприяло зростанню швидкості руху. У 1825 р. у Великій Британії була відкрита перша в світі залізнична лінія загального користування між Стоктоном і Дарлінгтоном. На цій залізниці рух відкрив паровоз Дж. Стівенсона «Локомошен» (від латинського loco moveo – зрушую із місця), який зберігся до наших днів і від якого походить назва залізничного рухомого складу – локомотивів. (*1079 др.зн.*)

8. У професіограмі «інженера» серед вимог зазначені такі: 1) високий рівень розвитку пам'яті, сприйняття, уваги, уяви, емоційно-вольової сфери; 2) високий рівень розвитку розумових здібностей (технічні, математичні, комунікативні здібності), гнучке абстрактно-логічне та аналітичне мислення; 3) уміння зосередитися, наполегливість, самостійність, самоконтроль; 4) високий рівень знань із фундаментальних і точних наук: із фізики, вищої математики, креслення, теоретичної механіки, нарисної геометрії, основ інформатики та обчислювальної техніки, іноземної мови; 5) уміння формулювати свою думку, доводити її вірність, відстоювати свої погляди та переконання; 6) здатність до міжособистісної взаємодії. Випускник вищого навчального закладу інженерного профілю повинен мати загально-професійні якості (уміння

врахувати екологічні вимоги й орієнтуватися на високі технології і нетрадиційні рішення; професійна ерудованість і активність у засвоєнні нового тощо) і спеціальні професійні якості (дослідницькі, проектувальні, виробничі, експлуатаційні, управлінські, інструкторсько-методичні тощо). (*1087 др.зн.*)

9. Інтермодальні вантажні перевезення включають у себе перевезення вантажів у контейнерах або транспортних засобах із використанням декількох видів транспорту (залізничним, морським і вантажівками) без обробки вантажу при зміні виду транспорту. Суть методу зводиться до проходження вантажів без їхньої обробки, що підвищує рівень безпеки, може зменшити витрати, і дозволяє швидше перевезення вантажів. Зменшені витрати порівняно з автомобільними вантажоперевезеннями – саме це є ключовою перевагою для міжконтинентального використання. У Сполученому Королівстві контейнери були вперше введені в 1920-х, що дозволило як залізничним, так і приватним транспортним засобам перевозити стандартні контейнери. Порівняно із сучасними стандартами ці контейнери були менші на п’ять або десять футів у довжину, зазвичай дерев’яними та з вигнутим дахом і недостатньо міцними. Піддони вперше з’явилися під час Другої світової війни, коли збройні сили Сполучених Штатів застосували перевезення вантажів на піддонах, досягнувши швидкої «передачі» їх між складами, вантажівками, потягами, кораблями та літаками. (*1093 др.зн.*)

10. Громадський транспорт – мережа пасажирського транспорту, яка обслуговує широкий загал пасажирів на противагу приватному транспорту. Послуги громадського транспорту надаються за певну плату через придбання спеціалізованих одноразових (на одну поїздку) квитків або проїзних документів на певний термін (на 1 місяць, 3 місяці, 6 місяців тощо). Громадським транспортом є автобус, тролейбус, метро, трамвай, легко-рейковий транспорт, приміські потяги, пороми, водні таксі, монорейки. Найбільш розвинений в урбанізованих регіонах, але меншою мірою у Північній Америці й Австралії. Нерейковий громадський транспорт охоплює автобуси, метробуси, тролейбуси.

Автобус є автомобільним транспортом, здатним перевезти багатьох пасажирів. Автобуси рухаються звичайними дорогами, автобусні зупинки дешеві в обслуговуванні. Тому автобуси є провідним перевізником у сільській місцевості, в невеликих містах і селищах. Крім того, вони є важливою часткою транспортної мережі великих міст. Метробус потребує відокремленого шляху, на кшталт легко-рейкового транспорту. Тролейбус використовує контактну мережу задля живлення. (*1099 др.зн.*)

UNIT 2. PRE-CASE STUDYING, REVISION AND TRAINING

SEQUENCE OF TENSES

Якщо присудок головного речення стоїть у одному із минулих часів (Past Tenses), то і присудок підрядного речення повинен стояти в одному з минулих часів (Past або Future-in-the-Past).

He **says** that	*He **said** that*
he **will translate** this text tomorrow.	he **would translate** that text tomorrow.
he **translates** such texts with a dictionary.	he **translated** such texts with a dictionary.
he **is translating** this text now.	he **was translating** that text at that time.
he **has** already **translated** this text.	he **had** already **translated** that text.
he **translated** this text yesterday.	he **had translated** that text the day before.

1. Для передачі одночасних дій:

головне речення	підрядне речення
Past Indefinite	*Past Indefinite* або *Past Continuous*
*We **knew** he **drank** only fruit juice.*	Ми ***знали***, що він ***п'є*** лише фруктовий сік.

2. Якщо дія підрядного речення відбулася раніше дії головного речення:

головне речення	підрядне речення
Past Indefinite	*Past Perfect* або *Past Perfect Continuous*
*I **was** sure that he **had left** Washington D.C.*	Я ***був*** впевнений, що він ***поїхав*** із Вашингтона.

3. Якщо дія підрядного речення відбудеться пізніше дії головного речення:

головне речення	підрядне речення
Past Indefinite	*Future-in-the-Past*
*I **hoped** I **would find** him at the conference.*	Я ***сподівався***, що ***знайду*** його на конференції.

Винятки з правила узгодження часів

Якщо дієслово у підрядному реченні виражає загальновідомий факт, або ситуацію, яка досі не змінилася та відповідає існуючому стану речей, дієслово у підрядному реченні може стояти у теперішньому або майбутньому часі.

*Galileo **proved** that the earth **moves** round the sun.* — Галілео довів, що Земля обертається навколо Сонця.

*I **came** to tell you that I **will vote** against you.* — Я прийшов тобі сказати, що голосуватиму проти тебе.

Exercise 1. Translate the following sentences

1. She *thinks* that you *passed* your examination in physics. She *thought* that you *had passed* your examination in physics. 2. They *know* you *will graduate* from the institute next year. They *knew* you *would graduate* from the institute the next year. 3. She *wants* to know whether you *completed* your work yesterday. She *wanted* to know whether you *had completed* your work the day before. 4. We *know* that the young writer *is working* on a novel. We *knew* that the young writer *was working* on a novel. 5. We *knew* that you *had gone* sightseeing. 6. He *said* he *had lost* his way. 7. He *knew* that I never *missed* the seminars. 8. We *thought* that we *would be able* to see our old friends. 9. They *thought* I *could* drive a car. 10. I *knew* he *was experimenting* at the lab. 11. We *considered* that she *had* already *obtained* her Master's degree in mathematics. 12. We *knew* that his family lived in Orel. 13. He *said* that the students of that group were studying in the library. 14. She *thought* that she might finish her work by two o'clock. 15. I *didn't think* he could come there in time. 16. She *said* that her name was Lena. 17. The students *were told* that they had three lectures every day.18. The dean *said* that he was busy. 19. We *found* that he had studied mathematics at the University. 20. The newspapers *reported* that the Trade Union Congress had finished its work. 21. Students *were informed* that they would have industrial training in the third year. 22. The weather-man *reported* over the radio that it would be cold the following weekend.

Exercise 2. Write the principal sentence in the past and point out that the action of the subordinate clause took place before it

Model: I <u>say</u> that I <u>read</u> the book before. – *I <u>said</u> that I <u>had read</u> the book before.*

1. I am sure that you have seen the new film. 2. We are glad that you enjoyed your trip. 3. We know that you prefer to spend your days off in the country. 4. I am afraid Ann does not know anything about her friend's plans. 5. He says that he met this woman somewhere before. 6. Nick says that the city makes a great impression on him.

Exercise 3. Write the principal sentence in the past and point out that the action of the subordinate clause took place: a) after it; b) simultaneously

Model: She says that she takes books from the library.

a) She said that she would take books from the library.

b) She said that she took books from the library.

1. I know that they will discuss the plan at the meeting. 2. We think that you will enjoy this film. 3. We know that there are many places of interest there. 4. We think that you are full of impressions. 5. We are sure you admire these art treasures. 6. He thinks the house is surrounded by a high wall.

Exercise 4. Put the following sentences in the Indirect Speech beginning with the words given in brackets

1. Where did I put the book? (*I forgot …*) 2. Who has given you this nice kitten? (*She wanted to know…*) 3. Where can I buy an English-Russian dictionary? (*He asked me …*) 4. How long will it take your brother to get to Madrid? (*He wondered …*) 5. Where is he going? (*He didn't tell anybody …*) 6. Where has he gone? (*Did you know …*) 7. Where is he? (*Did you know …*) 8. When is he leaving school? (*I wanted to know …*) 9. Where does he live? (*Nobody knew …*) 10. When will he come back? (*She asked them …*) 11. Where did she buy this hat? (*He wanted to know …*) 12. How much did she pay for it? (*I had no idea …*)

Exercise 5. Put the following words given in brackets in the right tense according to the Sequence of Tenses rules

A. 1. He says that he (want) to be an engineer. 2. He thinks that he (see) a new device already. 3. He knows that he (lose) his watch yesterday. 4. He says that he (help) with work next week. 5. He said that he (know) him. 6. He understood that the speaker (be) in London recently. 7. He said that he (think) about it later. 8. He asked what they (want) to do. 9. They asked when we (come) to see him. 10. He asked if I (can) stay with them. 11. The teacher wanted to know whether I (be) good at Maths. 12. The professor wanted to know whether I (take) part in our conference the week before. 13. My friend wanted to know whether I (go) to the library next Saturday. 14. He asked which book she (read) at that moment.

B. 1. The engineer was told that he (may) test the device in the afternoon. 2. It was known that the head of our laboratory (be) a graduate of Moscow University. 3. They

thought that she (graduate) 63 from a technical institute. 4. Our professor informed us that he (give) the following lecture on quantum mechanics on Monday. 5. At the meeting it was said that our lecturer (work) at a new programme of laboratory work. 6. The teacher told us that the term «engineering» (have) many Russian equivalents. 7. The chief engineer believed that we (work) at that problem for a month the following summer.

Exercise 6. Translate the following sentences

1. Я думала, що ви запізнитеся на конференцію. 2. Ми вважали, що ви працюєте над дипломним проектом. 3. Ми думали, що ви вже знайшли свій проект. 4. Я знав, що ви вже купили квиток до Львову. 5. Вона сказала, що збирається поїхати до міста. 6. Староста сказав, що взяв у бібліотеці усі необхідні книги. 7. Вона сказала, що піде до музею наступного тижня. 8. Я був упевнений, що ви перекладали статтю без словника. 9. Я не знала, що усі товари розвантажили до 6 години. 10. Ми не були впевнені, що ці шедеври живопису так вразять вас. 11. Ми були впевнені, що цей вокзал асоціюється з ім'ям та біографією видатного письменника. 12. Оглядаючи локомотив, машиніст побачив, що електродвигуни перегрілися. 13. Нас повідомили, що експерименти з новими будівельними матеріалами буде завершено за два тижні. 14. Він сказав, що його думка з приводу стану колії значно відрізняється від позиції інших експертів. 15. Правління компанії повідомило, що було розпочато випуск нового електровоза для швидкісних перевезень.

THE PARTICIPLE

Дієприкметник є неособовою формою дієслова, що має властивості дієслова, прикметника й прислівника. Подібно до прикметника, дієприкметник може бути означенням до іменника або іменною частиною складеного присудка:

a ***broken engine*** ***зламаний*** *двигун*
an engine *was* ***broken*** *двигун було* ***зламано***

Подібно до прислівника, дієприкметник може бути обставиною, яка характеризує дію, виражену присудком:

Reading *the text he wrote out new words.* ***Читаючи*** *текст, він виписував нові слова.*

Подібно до дієслова, дієприкметник має аспектно-часові й ста́нові форми, може мати прямий додаток і визначатися прислівником. У англійській мові існує два види дієприкметників: **Participle I** й **Participle II**.

Participle I утворюється шляхом додавання закінчення **-ing** до основи дієслова:

to speak – speaking, to begin – beginning, to travel – traveling, to drive – driving.

Participle II правильних дієслів утворюється шляхом додавання закінчення **-ed** до основи дієслова, неправильних дієслів утворюється особливими способами; це третя форма неправильних дієслів:

to develop – developed, to ask – asked, to train – trained.

to build – built, to speak – spoken, to give – given,.

Усі інші складні форми **Participle I** утворюються за допомогою допоміжних дієслів **to be** або **to have** і **Participle II** смислового дієслова.

Форми дієприкметників

Participle I			**Participle II**
	Active	*Passive*	
Indefinite	*develop**ing*** *build**ing***	*being develop**ed*** *being **built***	*develop**ed*** ***built***
Perfect	*having develop**ed*** *having **built***	*having been develop**ed*** *having been **built***	

Причому слід пам’ятати, що дія, виражена дієприкметником **Indefinite Participle I**, відбувається одночасно з дією, що виражена присудком. А дія, виражена дієприкметником **Perfect Participle I**, відбулася раніше, ніж дія, виражена присудком:

Indefinite	**Participle I**	
	Active	*Passive*
	giving	**being asked**
	The professor giving a lecture showed many diagrams. – Викладач, який читав лекцію, продемонстрував багато діаграм. (*giving* – означення)	*The student being asked by the teacher gave an excellent answer.* – Студент, якому викладач поставив запитання, дав блискучу відповідь. (*being asked* – означення)

	Giving a lecture the professor showed many diagrams. – Читаючи лекцію, викладач продемонстрував багато діаграм. (*giving* – обставина)	*Being asked the student didn't know what to say*. – Коли студента запитали, він не знав, що відповісти. (*being asked* – обставина)
Perfect	**having given** *Having given a lecture, the professor answered a lot of questions.* – Прочитавши лекцію, викладач відповів на багато запитань. (після того, як викладач прочитав лекцію)	**having been asked** *Having been asked a lot of questions, the lecturer decided to give an explanation.* – Після того, як лектору поставили багато запитань, він вирішив пояснити.

Функції дієприкметника в реченні. Основні способи перекладу

Дієприкметник виконує дві функції в реченні – означення й обставини.

1. Дієприкметник у функції **означення** може займати місце перед пояснюваним іменником або після нього. У цьому випадку Participle I зазвичай перекладається на українську мову підрядним реченням зі сполучником *який (яка, яке, які)*:

*The **waiting** man is in the library.*	Чоловік, ***який чекає***, знаходиться у бібліотеці.
*The man **waiting** for you has come from Kyiv.*	Чоловік, ***який чекає*** на вас, приїхав із Києва.
*The man **waiting** for you asked for your telephone number.*	Чоловік, ***який*** на вас ***чекав***, питав ваш телефонний номер.

Складна форма Participle I пасивного стану у функції означення (після іменника) може перекладатися також підрядним означальним реченням:

*The house **being built** in this street now will be a new library.*	Будинок, ***який зводять*** на цій вулиці, буде новою бібліотекою.

Participle II у функції означення (до або після іменника) перекладається на українську мову пасивним дієприкметником теперішнього або минулого часу, що закінчується на *-аний, -ений, -итий, -утий*:

*The **discussed** problems are interesting.*	***Обговорювані*** проблеми цікаві.
*The problems **discussed** at the conference are interesting.*	Проблеми, ***обговорювані*** (***які обговорюються***) на конференції, цікаві.
*The problems **discussed** at the last conference were interesting.*	Проблеми, ***обговорені*** на останній конференції, були цікаві.

2. Дієприкметник у функції обставини зазвичай стоїть на початку речення, тобто, передує підмету, або йде за групою присудка. У цьому випадку дієприкметник може виконувати функцію обставини часу, причини, умови

тощо. У цій функції дієприкметнику можуть передувати сполучники *when, while, if, unless, once, though* тощо. Дієприкметник (із сполучником або без нього) перекладається на українську мову або повним підрядним реченням часу, причини, умови, або дієприкметником, що закінчується на *-ючи, -ячи, -вши,* або іменником з прийменником *при*:

*While **reading** the book I met many new facts.*	***Читаючи*** цю книгу, я зустрів багато нових фактів.
***Crossing** the street first look to the left.*	***Переходячи*** вулицю, спочатку подивіться ліворуч.
*When **crossing** the street, first look to the left.*	***Коли переходите*** вулицю, спочатку подивіться ліворуч.
***Being heated** magnetized materials lose their magnetism.*	***Якщо нагрівати (при нагріванні)*** намагнічені матеріали, вони розмагнічуються.
***Having finished** the test he put down the results.*	***Закінчивши тест***, він записав результати.
*When (if) **insulated**, the wire may be used as a conductor.*	***Коли (якщо) дріт ізольований***, він може бути використаний як провідник.
*The motor gets overheated, unless **cooled**.*	Мотор перегрівається, ***якщо його не охолоджувати***.

Exercise 7. Read and translate the word combinations

having entered the Institute	having been asked about the work
having calculated the distance	having been published in many languages
having developed the speed of 120kmh	having been adopted, the resolution …
having introduced new methods of work	having been taken, this decision …
having decided to leave the city	having been sorted, all materials …
having divided the apple into three parts	having been delivered, the information …
having installed new equipment	having been sent, the letters …
having obtained the necessary data	having been cleaned, the territory …
having found the new way	having been changed, the methods …
having changed his behaviour	having been manufactured, a new design

Exercise 8. Translate the word combinations

вивчивши іноземну мову	вивчаючи іноземну мову
прочитавши цікаву книгу	читаючи цікаву книгу
зробивши домашнє завдання	виконуючи домашнє завдання

зателефонувавши інженеру	телефонуючи інженерові
застосувавши новий метод	застосовуючи новий метод
дав відповіді на усі запитання	відповідаючи на усі запитання
закінчивши роботу вчасно	закінчуючи роботу
загубивши їхню адресу	шукаючи їхню адресу
вибравши необхідний маршрут	вибираючи необхідний маршрут
заснувавши новий офіс	засновуючи новий офіс

Exercise 9. Translate the sentences, state the form and function of the Participle

1. The translated article was very interesting. The article being translated by this student is necessary for the report. Having been translated, the article was published. Having translated the article, the student showed it to the teacher. The article translated, we decided to show it to the engineer.

2. He was given a very difficult text for translation. The text given to him at the examination was very difficult. Being occupied in his work, he did not notice when we entered the room. The text being interesting, we translated it with pleasure.

3. The key having been found, we could open the room. Having found the work interesting, I decided to take part in it.

4. The letter having come too late, we could do nothing. People coming to St Petersburg admire its architectural ensembles.

Exercise 10. Find participles and state their functions. Translate the sentences

1. Not having bought tickets in advance, we had to go to the theatre long before the performance started. 2. Having finished the test, the students were allowed to leave the room. 3. The man making a report is a good speaker. 4. When asked about the exhibition held in the Gallery, the young man said that he had admired it greatly. 5. Being fond of skiing, John always joins us for skiing trips at weekends. 6. Having been given all the instructions, we began our work. 7. If sent away now, the letter will arrive the day after tomorrow. 8. Not knowing grammar, one cannot speak correctly. 9. Having been properly tested, the device was put into production. 10. The building of the new cinema being built in our street just now is of modern design. 11. Being divided into sections, the railway handles the traffic more efficiently. 12. Having

been warned of the train collision, the dispatcher immediately sent a special train to the scene of the accident. 13. Being introduced on the railways, the automatic train control will facilitate both the work of the driver and dispatcher.

Exercise 11. Put in the correct form of the participles

Model: Having filled up with petrol, we continued our journey.

1. I broke a tooth (*bite*) on a nut. 2. Michael drove home from work, (*achieve*) nothing all day. 3. I just had to stand there (*stare*) at by all those people. 4 (*Look*) round the museum, we went back to our hotel. 5. Every single sandwich (*eat*), there was no food left. 6. The drugs entered the country (*hide*) in a container. 7. (S*earch*) the building, the police went away again. 8. (*Catch*) sight of Adam across the street, she waved at him.

Exercise 12. Rewrite the sentences, using the Perfect Participle

Model: He finished work and went home. – *Having finished work, he went home.*

1. He read a book and went to bed. 2. He worked hard and saved a lot of money. 3. I came to live in the country a few years ago. I now realize how much I hated living in town. 4. He graduated from university, and went off to work in Australia. 5. When you go abroad, it is advisable to take out travel insurance. 6. I came across a wonderful book. I was searching for something interesting to read for several days. 7. I worked hard, and I managed to pass all my exams. 8. When we heard the weather forecast, we decided not to go camping in the mountains.

Exercise 13. Change the following sentences, using participles instead of the subordinate *italicised* **clauses**

1. The people *who live in this old block of flats* will soon get new flats. 2. The question *which is being discussed now* is very important for the organization of our future work. 3. *As we had a lot of time*, we did not hurry. 4. *As I had left your telephone number at home*, I could not ring you up. 5. The woman *who is being painted just now* is a famous actress. 6. *As he was ill for a long time*, he could not finish his project in time. 7. *After I had read the book*, I returned it to the library. 8. Young artists *who are taking part in this exhibition* have graduated from the

institute quite recently. 9. *While she was looking at his picture* she was thinking of the progress he had made.

Exercise 14. Translate the word combinations using participles

Лист, одержаний вчора; одержуючи листи; одержавши листа; студенти, які слухають доповідь; прослухавши останні новини; слухаючи радіо; дівчинка, яка читає книгу; читаючи книгу; прочитавши книгу; студент, який показує свій проект; проект, показаний нам; показуючи свій проект; показавши свій проект; маючи усі необхідні документи; коли нас запитали; коли до нас звернулися; зробивши переклад; перекладаючи.

Exercise 15. Make up sentences matching the suggested parts. Translate them

The questions	tested	demanded further consideration.
The equipment	discussed	showed good performance.
The results	obtained	proved the validity of this method.
The goods	decomposed	speeded up the reaction.
The data	described	required improvement.
The substances	delivered	helped to satisfy growing demand.
	produced	worked properly.

Exercise 16. Choose the correct form of Participle. Translate the sentences

1. … (building, being built) on the basis of transistors lasers are successfully used in technology. 2. The experiment … (describing, described) attracted general attention. 3. This plant produces large quantities of the pig-iron, most of the pig-iron … (being turned, having been turned) into steel. 4. The mechanic … (having repaired, having been repaired) the motor, the engineer examined it. 5. Numerous new instruments are … (using, being used) in many branches of science and technology. 6. The amount of coal … (extracting, extracted) varies from mine to mine. 7. The problem … (discussing, discussed) dealt with safety in mines. 8. At our University there are several subjects (studied, studying) optionally. 9. Students (taking, taken) exams next week should come to the dean's office. 10. The engineer (represented, representing) this factory is a good specialist. 11. Scientists (applied, applying) new methods will obtain interesting results. 12. (Having graduated, graduating) from the Institute, he

began to work at an office. 13. The problems (discussing, discussed) at the conference are of great importance for future research. 14. Students (studying, studied) foreign languages should read special literature in the original. 15. Specialists (training, trained) at our University work in various fields of the national economy. 16. (Having written, writing) the letter, she posted it. 17. (Building, having built) a house they used all modern methods of construction.

ABSOLUTE PARTICIPLE CONSTRUCTION

(Незалежний дієприкметниковий зворот)

Дієприкметникові звороти з *Present Participle* та *Past Participle* поділяються на залежні та незалежні. Залежні дієприкметникові звороти відносяться до підмета всього речення. Незалежні дієприкметникові звороти мають свій власний підмет та відокремлюються від головного речення комою.

Absolute Participle Construction на початку речення перекладається підрядним реченням умови, причини або часу, які вводяться прикметниками: *якщо, через те що, оскільки, з огляду на те що, коли, після того як*:

***The conditions permitting**, we shall test the new model tomorrow.*	(якщо)
***The professor being ill**, the lecture was put off.*	(через те що)
***The work having been completed**, Mr Jones left London for Kyiv.*	(після того, як)

Absolute Participle Construction у кінці речення передає супутні обставини та перекладається самостійним реченням зі словами: *причому, у той час як, при цьому.*

*The owner was fined by the Customs, **the goods being confiscated**.*	(причому)
*A little girl walked past, **her doll dragging** behind her on the pavement.*	(а)

Примітка У науково-технічній літературі самостійний дієприкметниковий зворот часто вводиться прийменником *with,* який не перекладається.

***With the experiments having been carried out**, we started new investigations.*	Після того, як були проведені експерименти, ми почали нові дослідження.

Exercise 17. Translate the sentences paying attention to the translation of the Absolute Participle Construction

1. This is a device used for detection and measurement of light, its principle of action being simple. 2. The monorail having been built in Tokyo, the problem of traffic congestion was partly solved. 3. With the driver's cab equipped with radio, the danger of train collision can be easily eliminated. 4. The information on the goods trains at the sorting yard being processed by computers, the efficiency of sorting operations is very high. 5. Both electric and diesel locomotives are now in operation on our railways, the diesel being the best type for marshalling yards. 6. Stations and other railway buildings being subjected to intensive vibration and noise, strong and sound-resistant materials should be used in their construction. 7. My friend was reading an English article, his brother watching television. 8. Electrical devices find a wide application in every house, a refrigerator being one of them. 9. The energy sources of the world decreasing, the scientists have to look for new sources of energy. 10. There are different sources of energy, the sun being an unlimited source of all forms of energy. 11. Industrial applications of energy increasing, more and more energy is needed every year. 12. Molecules are constantly in rapid motion, the motion becoming more rapid with an increase of temperature. 13. The atoms of different substances have different weights, their properties being also different. 14. The atomic energy being developed in a reactor in the form of heat, we can get both heat and power. 15. Power is the basis of civilization, all industry and transport being dependent upon power. 16. An electric conductor being moved in a magnetic field, an electric current is generated. 17. There are many different types of transformers, the principles of action being the same in each case. 18. The proposal being unconstitutional, the committee rejected it. 19. England being a constitutional monarchy, the Queen of England is only a formal ruler. 20. The final round of the negotiations over, a joint communiqué was signed. 21. London is not only the center of commerce and finance but also a great port, with many of the imported and exported goods passing through it. 22. It being Sunday, the shops were closed. 23. There being a lot of things to discuss, the conference lasted long.

Exercise 18. Find the subject of the Absolute Participle Construction. Translate the sentences

A. 1. The room being dark, we couldn't see anything. 2. The book being translated into many languages, everybody will be able to read it. 3. Peter having passed his exams, we decided to have a rest in the country. 4. We went for a walk, our dog running in front of us. 5. The test work having been written, he gave it to the teacher and left the room. 6. They having arrived at the station early, all of us went to the cafe. 7. My friends decided to go to the park, the weather being warm and sunny. 8. Our library buying all the new books, we needn't buy them ourselves. 9. The fuel burnt out, the engine stopped. 10. Many scientists worked in the field of mechanics before Newton, the most outstanding being Galileo.

B. 1. Numerous experiments having been carried out at the orbital stations, it became possible to develop new methods of industrial production of new materials. 2. President Jefferson having offered his personal library, the foundation of the Library of Congress was laid. 3. Anthony Panizzi designed the Reading Room of the British Museum, the Reading Room being a perfect circle. 4. A beam of light being transmitted forwards, it is possible to measure the distance between the car and the other cars in front of it. 5. The distance having been measured, the computer adjusts the car's speed. 6. Two metallurgists produced a new super plastic metal, the new steel showing properties identical to Damascus steel. 7. The young physicist having discovered Newton's error, other scientists confirmed it. 8. The first TV sets having been shown in New York, the news about it spread throughout the world.

C. 1. With the first steam engine built in the 17-th century, people began to use them in factories. 2. The inventor was demonstrating his new device, with the workers watching its operation attentively. 3. With his numerous experiments being over, Newton was able to write his work very quickly. 4. With the current being switched on, the machine automatically starts operating.

Exercise 19. Combine two sentences, using the Absolute Participle Construction

Model: The book was interesting. We read it with pleasure.

The book being interesting, we read it with pleasure.

1. Our friend helped us. We could fulfil our work in time. 2. There were no trams at that late hour. We had to walk home. 3. The magazines have been brought. The students could start doing translations. 4. The experiment has been over. Everybody left the laboratory. 5. The speaker has finished the report. We began to discuss it. 6. The train has left; we went home. 7. The book was read; we decided to discuss it. 8. The first part of the work was completed; the results were published. 9. The journal contained a number of interesting articles; one of them was devoted to cybernetics. 10. Many specialists work on the problem of corrosion; special attention is paid to the problems of protection of steel surfaces from corrosion. 11. The articles on plasma chemistry were published; the students got interested in them. 12. Electrons move through a wire; electrical energy is generated. 13. The temperature of a wire is raised; the motion of the electrons increases.

Exercise 20. Use the Nominative Absolute Participial Construction for the Ukrainian clauses

1. I put on a warm coat, (оскільки був сильний вітер). 2. (Оскільки було ще дуже рано), we had to wait. 3. (Коли поїзд наближався до станції), they saw a crowd of people trying to get on. 4. The red car was upside down, (а його колеса усе ще крутились). 5. (Оскільки щойно підійшов поїзд), the platform was crowded. 6. We continued our discussion, (причому ораторів увесь час перебивали питаннями). 7. (Після того, як термін його служби (the duration of his engagement) добіг кінця), he was demobilized. 8. He put on his dark glasses, (оскільки сонце світило дуже яскраво). 9. (После того як він зареєстрував свій багаж), we rushed toward the ramp.

THE GERUND

Герундій – це неособова форма дієслова, що має властивості дієслова та іменника (віддієслівний іменник). Герундій називає дію як процес: ***reading*** *читання,* ***listening*** *слухання.*

Форми герундія

	Active	*Passive*
Indefinite (Simple)	***writing***	***being written***
Perfect	***having written***	***having been written***

Неперфектна форма (*Indefinite, Simple*) виражає дію, одночасну з дією присудка; може відноситися до майбутнього, або не залежати від часу:

*We intend **shipping** the goods in May* — Ми сподіваємося ***відправити*** товари у травні. (відноситься до майбутнього)

*He likes **being invited** by his friends.* — Він любить, коли ***його запрошують*** друзі. (не залежить від часу)

*He sat without **turning** his head.* — Він сидів, ***не обертаючись***. (одночасна дія)

Перфектна форма виражає дію, що відбулася раніше дії присудка:

*Thank you for **having helped** me.* — Дякую, що ***допомогли*** мені.

Після прийменників *on, after* вживається неперфектний герундій:

After talking** to you I always feel better.* — ***Після того, як з тобою ***поговорю***, я завжди почуваю себе краще.

Функції герундія

Функції	*Приклади*	
Підмет	***Smoking** is not allowed here.*	***Палити*** тут не дозволено.
Іменна частина присудка	*His hobby is **driving** a car.*	Його хобі – ***керування*** машиною.
Додаток прямий (після *begin, start, (dis)like, continue, prefer, hate, intend, can afford, need, remember, enjoy, mind, be busy, excuse, be worth etc)*	*Excuse my **interrupting** you.* *They **began building** new houses here.*	Пробачте, що ***втручаюсь***. Вони почали ***будувати*** тут нові дома.
прийменниковий (після *depend on, rely on, dream of, object to, blame for, thank for, be interested in, be surprised at, be responsible for, prevent from, result in, be engaged in, fear of, think of, be afraid of, be fond of, insist on, get used to, look forward to, feel like, cat't help etc.*)	*They spoke about their **travelling** to the North.* *I look forward to **receiving** your letter.* *You'll get used to **driving** on the left.*	Вони говорили про ***подорож*** на Північ. Я з нетерпінням чекаю на (***отримання***) вашого листа. Ви звикнете до ***кермування*** по лівому боці (лівостороннього руху).

Обставина (після прийменників a*fter, before, on, by, without, instead of, besides*)	***After reading*** *the letter I put it into the drawer.* *They ate* ***without talking****.*	***Прочитавши*** листа, я його відклав у шухляду. Вони їли, ***не розмовляючи***.
Означення (після абстрактних іменників *importance of, interest in, reason for, hope of, way of, experience in, opportunity of, idea of, chance of*, перед означуваним іменником)	*What's your idea of* ***bringing*** *up children?* *She had come with the intention of* ***saying*** *something definite.* *You have always been in the habit of* ***giving*** *her playthings.*	Яка твоя думка про ***виховання*** дітей? Вона прийшла з наміром щось ясно ***висловити***. Ви завжди маєте звичку ***давати*** їй іграшки. ***writing*** *paper,* ***dancing*** *place.*

Примітка 1. Перед герундієм може стояти присвійний займенник або іменник у присвійному відмінку:

I don't mind ***your*** *going without me.*
She was angry at ***John's*** *saying these words.*

Примітка 2. Після *need, want, require, be worth* вживається герундій у дійсному стані, незважаючи на пасивне значення: *My shoes* ***need*** *repairing.*

Exercise 21. Complete the sentences with *–ing* **forms of the following verbs:**

answer, climb, drink, forget, hear, learn, lie, pay, say, ski, type, watch.

1. ... too much alcohol is very bad for you. 2. I don't like ... bills. 3. He really enjoys ... his own voice. 4. What's wrong with ... in bed all day? 5. Her favourite sports are ... and ... mountains. 6. ... languages is hard work. 7. I hate ... goodbye. 8. ... is better than remembering. 9. ... animals can teach you a lot. 10. 'What's your job?' – '... the phone and ... letters.'

Exercise 22. Make up sentences from the table

1. Are you interested	about	answering that child's questions.
2. Do you feel	as well as	changing her job, but I don't think she will.
3. Do you have time	at	coming to Greece with us?
4. He insisted	besides	convincing the police that she was not a
5. He passed his	for	burglar.

exams	in	cooking.
6. How	in spite of	disturbing you.
7. I apologize	instead of	eating.
8. I like walking	like	going out to a restaurant tonight?
9. I sometimes dream	of	having time to read all my books.
10. I'm fed up	on	helping me?
11. I'm not capable	with	looking after the children?
12. I'm tired	without	moving to Canada.
13. She succeeded		not doing any work.
14. She talked		paying for everything.
15. She's keen		playing football.
16. She's very good		seeing George next week.
17. Thank you		selling things.
18. We're excited		staying at home?
19. We're thinking		swimming and dancing.
20. Why don't you		telling me the truth.
come out with us		understanding this – it's too difficult.
21. You can't live		

Exercise 23. Translate the sentences paying attention to the Gerund

1. *Reading* English technical journals is important for an engineer. 2. They finished *installing* the apparatus only on Saturday. 3. They began *making* the experiment in May. 4. After *failing* his examination in January he had to take it again in February. 5. After the meeting they discussed different ways of *improving* their work. 6. The organizers of the conference were informed of his *refusing* to take part in it. 7. We heard of the experiment *having started* last week. 8. He improved his report by *changing* the end. 9. New possibilities for *applying* atomic energy open up. 10. I am looking forward to *sending* my children to the country for the holidays. 11. I'm surprised at his *missing* lessons so often. 12. I'm surprised at your *having missed* so many lessons.

Exercise 24. Combine the sentences using the Gerund

Model A: After he finished school, he worked at a plant. – *After finishing school he worked at a plant.*

1. After they passed their exams, they went to the mountains. 2. Before he moved to this town he lived in Kiev. 3. After he wrote the letter, she went to the post-office. 4. Before you cross the street you must look to the left and then to the right. 5. I turned off the light before I left home. 6. We met him after we walked about two miles.

Model B: She insisted that she should go to the library. – *She insisted on going to the library.*

1. He insisted that he should show them the way. 2. He insisted that he should be shown the way. 3. They insisted that they should help me. 4. They insisted that they should be helped with their work. 5. I insisted that I should examine them in the afternoon. 6. I insisted that I should be examined first.

Model C: When she plays, I enjoy it. – *I enjoy her playing.*

1. When you quarrel, I dislike it. 2. When you open the window, I don't mind it. 3. When they dance, I enjoy it. 4. When he gets an excellent mark, his parents are pleased with it. 5. If you make noise, I dislike it. 6. When you don't know the lesson, I am surprised at it. 7. If you pass your examination well, I'll be proud of it.

Exercise 25. Put in the correct forms of the Gerund

It takes your breath away!

The art of (*cook*) requires the use of garlic. Of course, (*eat*) of garlic is not generally approved of. (*Work*) beside someone who has eaten garlic is as bad as (*sit*) beside someone who smokes. But while (*smoke*) is definitely bad for you, there is no doubt that (*eat*) garlic is good for the health. We are likely to see more 'No (*smoke*)' signs, but we won't see any 'No (*breathe*)' signs for garlic eaters! (*Cultivate*) and (*export*) garlic has become big business now that so many people use it for (*flavour*) meat and (*add*) to different dishes. People often buy it when they do the (*shop*). You don't have to deny (*use*) it or (*have* / *eat*) it. (*Be*) a garlic eater is something to be proud of and shows you enjoy good (*live*). The story of garlic is a breathtaking success!

Exercise 26. Choose the correct form of Active or Passive Gerund. Translate the

sentences

1. I don't appreciate … (interrupting, being interrupted) when I'm speaking. 2. I'm interested in … (improving, being improved) my communication skills. 3. Can you remember … (having seen, having been seen) this film before? 4. … (having corrected, having been corrected) by the secretary, the text contained no more mistakes. 5. After … (being corrected, correcting) the student's report was returned to him. 6. We know of power engineers … (having used, having been used) vacuum tubes in industrial equipment. 7. Jill's low test score kept her from … (admitting, being admitted) to the university. 8. Mr. Brown gave no indication of … (changing, being changed) his mind. 9. I wondered at my father's … (having allowed, having been allowed) the journey. 10. On … (telling, being told) the news she turned pale. 11. If you want to develop your inner tranquility, you have to stop … (being bothered, bothering) by every little thing that happens. 12. We know of our engineers … (having developed, having been developed) several types of winders.

Exercise 27. Translate into English using the Gerund

1. Пробачте, що я запізнився. 2. Я не сподіваюсь побачити його скоро. 3. Дякую вам за те, що показали нам дорогу до міста. 4. Я здивований, що ти пропустив так багато занять. 5. Мені дивно, що ви так часто запізнюєтесь. 6. Я проти того, щоб це питання обговорювали сьогодні. 7. Ми наполягаємо на тому, щоб цей будинок було відремонтовано. 8. Вона пішла з дому, не вимкнувши телевізора. 9. Він пішов, не попрощавшись. 10. Я з нетерпінням чекаю того, що знов побачу мою подругу. 11. Мені не подобається ідея залишитися на вокзалі. 12. Він захоплюється ремонтом комп'ютерної техніки. 13. Цей факт не варто згадувати. 14. Ми були зайняті установкою обладнання. 15. Одержавши добрі результати, вони закінчили експеримент. 16. Ти можеш покластися на те, що я усе зроблю вчасно. 17. Вона боїться залишитися вдома сама. 18. Зараз я не в настрої дискутувати. 19. Ви можете покращити свої знання, читаючи спеціальну наукову літературу.

Exercise 28. Complete the following situations using sentences with "be/get used to doing smth".

Example**:** Bill doesn't have any money. He doesn't find this unusual because he has never had any money. He is used to having no money.

1. Connie earns her own money. She doesn't mind this. She has been earning her money for the last two years. She … . 2. Connie saves some of her money. She doesn't mind it. She has been saving for the last six month. She … . 3. He's the boss. He managed people. He's been managing this firm for a number of years. He … . 4. He is in advertising. He likes advertising. He enjoys it. He … . 5. She buys only necessities. She doesn't mind it. She's been saving for traveling and recreation lately. She … . 6. They plan and control money carefully. They've avoided many family problems by planning and controlling money. They …

Exercise 29. Find out the sentences with the Gerundial construction. Translate them

1. The thunder is caused by heating the air by a spark. 2. A lightning conductor is a means of protecting buildings from the strokes of lightning. 3. We know of this house being destroyed by a stroke of lightning. 4. The professor knew about the students' going to the power station. 5. Seeing is believing. 6. She cannot read English without consulting a dictionary. 7. His having asked such a question shows that he did not prepare the text. 8. I remember my having told her about the experiment. 9. Lomonosov's having studied atmospheric electricity contributed to the development of science. 10. There are many methods of learning a foreign language. 11. On coming home he began watching TV. 12 A lot depends on your making the right choice.

Exercise 30. Translate the sentences. Mind the construction with the Gerund

1. Their having overheated the gas changed the results of the experiment. 2. The investigator mentioned his testing this material for strength. 3. We heard of our engineer having left for the international symposium. 4. We insisted on the experiment being repeated. 5. In spite of the gases being compressed they return to their original volume as soon as the applied force stops acting. 6. Newton's having stated the laws of motion is very important for modern science. 7. We knew of Newton's having developed the principles of mechanics. 8. We knew nothing of their

having been met at 65 the station. 9. Franklin's having worked in the field of electricity is known all over the world. 10. They didn't know of his having been given new materials. 11. We know of Faraday's having stated the law of electromagnetic induction. 12. We heard of the new computer having been put into operation.

CASE STUDY 04
TRACK AND TRACK FACILITIES

Do the following assignments to text abstract determined by your language supervisor as that for you to be analyzed individually

1. Write out of the text abstract all the Subjects. Analyze them and classify the means to express the Subject in English language.
2. Write out of the text abstract all the Predicates. Analyze them and classify the means to express the Predicate in English language.
3. Write out of the text abstract all the Objects. Analyze them and classify the means to express the Object in English language.
4. Write out of the text abstract all the Attributes. Analyze them and classify the means to express the Attribute in English language.
5. Write out of the text abstract all the Adverbial Modifiers. Analyze them and classify the means to express the Adverbial Modifier in English language.
6. Write out of the text abstract all the modal verbs. Explain their meanings and the ways to express English verb modality by means of Ukrainian language.
7. Write out of the text abstract all the Grammar structures having no Ukrainian equivalents. Explain the ways to translate such structures by means of Ukrainian language.
8. Write out of the text abstract all the abbreviations; give their non-contracted equivalents, compare the translations of the abbreviations to their non-contracted equivalents. Analyze the text abstract on the availability of non-contracted word combinations having generally-used abbreviations.
9. Write out of the text abstract all the international lexis; give their Ukrainian equivalents. Analyze the text abstract on the availability of Ukrainian words having generally-used international equivalents.
10. Write out of the text abstract all the “false friends of a translator”; give their proper meanings. Explain where it is possible the differences or peculiarities in the

meanings of the analyzed words. Explain the rules of choosing the proper lexical unit while translating.

11. Write out of the text abstract all the words used in their figural meaning; give their direct meaning. Explain the reasons of their using in a figural meaning.

12. Translate the following text abstract using available academic or electronic dictionaries (Multitran, Prompt etc.).

13. Make a plan of the text abstract.

14. Compile a vocabulary to the read and translated text abstract.

15. Compile a glossary of terms with their explanation in English to the analyzed text abstract.

WHAT IS A RAILROAD?

A railroad (or railway) is a mode of land transportation in which freight-goods and passenger-carrying vehicles, or cars, with flanged wheels move over two parallel steel rails. The guide-way, or track, consists of the parallel rails laid on crossties, or sleepers, and anchored in a bed of crushed rock or other ballast. The cars usually are pushed or pulled by a locomotive, although they may be self-propelled. The track gauge (the distance between inside faces of the rails) varies from country to country and sometimes among railroads within the same country. The predominant gauge among railroads of the world, however, is so-called standard gauge, which is four feet 8.5 inches (1.435 metres). The development of railroads is one of the great landmarks in the progress of civilization. From early in the 19th century, railroads provided an element that helped greatly to realize the potential of the Industrial Revolution in the form of a reliable, low-cost, high-volume system of land transportation. The railroad's basic principle, flanged steel wheels rolling on steel rails, is what gives this mode its unique capability for heavy-duty transportation. The flanges on the insides of the wheels guide the locomotives and the cars, causing them to follow the line of the rails; and the rolling friction of the wheels on the rails is extremely low. In fact, if a 40-ton (36,000 kilogram) railroad freight car of a standard United States tyre were set rolling on level track at 60 miles (about 100 km), it would need to pass 8

kilometres or more before coming to a stop. By contrast, a motor truck of similar weight set free on a level highway at the same speed would roll only about one mile (1,600 metres).

Because of this self-guiding characteristic and the low rolling friction, a locomotive of relatively modest horse-power can pull a long train of cars. This, basically, is the reason for the economy of railroad transportation. A freight train of 5,000 tons gross weight can be hauled with a locomotive of about 5,000 horsepower, depending on terrain and desired operating speeds, or approximately one horsepower per gross ton. Typical truck tractor-trailer combinations for intercity highway freight service are powered at about ten horsepower per gross ton. The railroad also has roughly the same 10 to 1 advantage in fuel economy and in employee productivity.

THE RAILROAD TRACK

The two rails of a track produce a most economical path for the smooth passage of heavily loaded vehicles at great speed. Sleepers or ties hold the two rails at the exact distance or gauge throughout and transfer the loads from the rails to the ballast. The ballast provides a resilient bed, keeps the sleepers in the correct position and at the correct level, distributes the load from the sleepers to a large area on the bed or formation of the track and drains off rainwater. The rails are fixed to the sleepers with various types of fittings, which depend on the type of the rail used, and on various other considerations. The rails, which are manufactured in standard lengths, are joined together with fishplates or joint bars through which fish bolts or track bolts are threaded. The combination of rails, sleepers, fittings, ballast, etc., is known as the track or permanent way. In some countries, temporary tracks were laid for conveyance of earth for the building up or the formation of a railway, and the permanent way was so called to distinguish the final layout from these temporary tracks. The railroad track of today is quite different from that used in the early days of railways. The first tracks had no ballast; the rails were made of wood and rested on heavy blocks of granite. Then the wooden rails were replaced by iron ones, and the granite blocks were replaced by wooden ties or sleepers. This kind of track, however, was not strong enough for heavy steam trains. The discovery how to make cheap steel

was of great importance to the railways for, when placed in the same track, steel rails had a life 15 times as long as iron rails.

The distance between the rails is called the gauge. The standard gauge in most countries is 1,435 mm while in former Soviet Union the railroads had a gauge of 1,524 mm. The place where the ends of the rails meet in the track is known as the rail joint. Some railroads have two or more tracks. In order to make the trains pass from one track to another the railroads have a switch which is a very important element of the track. Another improvement which has made it possible to increase speeds on railways is the use of concrete sleepers. Concrete sleepers have a longer life and a far greater weight than those made of wood. The greater weight of concrete sleepers provides the greater stability of track.

TRACK CONSTRUCTION

The track calling also the permanent way is one of the basic features of a railway. The first tracks had no ballast, the rails were made of wood and rested on heavy blocks of granite. The gauge, or distance between the inside faces of the running rails, is one of the main cost determinants. Generally, the narrower the gauge, the less costly is the line to construct and equip. This is why many of the railroads in undeveloped, sparsely settled countries have been built to narrow gauges. On a narrow-gauge line, curvature can be more severe, less space is required, construction can be lighter, and rolling stock is less costly. Disadvantages are the limitation of speed because of reduced lateral stability and limitations on the size of locomotives and cars. About 60 percent of the world's railroad mileage is built to standard gauges, 1.435 metres.

The advent of modern high-capacity earth-moving machinery, developed mainly for highway construction, has made it economically feasible for many railroads to eliminate former adverse grades and curves through line changes. Graders, bulldozers, and similar equipment make it possible to dig deeper cuts through hillsides and to make higher fills where necessary to smooth out the profile of the track. A number of railroads carried out ditching programs in which the drainage ditches along the roadbed were deepened. Where the roadbed is unstable, injecting

concrete grout into the sub-grade under pressure is a widely used technique. In planning roadbed improvements, as well as in new construction, railroads have drawn on modem soil-engineering techniques.

The first step in building a new railroad line, after the route has been surveyed and cleared of brush and trees, is to grade the right-of-way. Next, the crossties or sleepers are distributed and the rails laid and fastened to the ties. Then, ballast (usually crushed rock, or slag, or volcanic ash) is applied. Finally, the track is aligned in both the horizontal and vertical planes, and the ballast is tamped, or compacted, around and under the ties. In many countries track-laying machines have been used since World War II. The machine is mounted on railcars. It feeds ties and rails ahead of the working crew, moving forward over the new track as soon as it is spiked down.

TRACK STRUCTURE

The track is one of the basic features of a railway. The fact is that in the early days of railroad building the workers first had to lay temporary tracks to transport the materials to the construction site. And only after that they laid down the permanent tracks of the permanent way, as it was called the permanent way consists of rails, ties, and ballast. The first tracks had no ballast, the rails were made of wood and rested on heavy blocks of granite. Then the wooden rails were replaced by iron ones, and the granite blocks were replaced by wooden ties and sleepers. This kind of track was not strong enough for heavy steam trams. The discovery how to make cheap steel was of great importance to the railways for, when placed in the same track, steel rails had a life 15 times as long as iron rails. The rails differ greatly in weight according to the kind of traffic which they have to carry when placed in the track. The largest and heaviest rails are laid in the main-line tracks for it is these tracks which carry the largest volume of traffic.

Whether standard or long lengths, rails are joined to each other and kept in alignment by fish-plates or joint bars. The off-head spike is the most used and least expensive way of fastening the rails to wooden crossties, but several different types of screw spikes and clips are also used extensively on heavy-traffic lines in many countries. The rails may be attached directly to wooden crossties, but on heavy traffic

lines it is common to seat the rail in a tie plate that distributes a load over a wider area of the tie. A screw or clip fitting must be used to attach rails to concrete ties. A pad of rubber or other resilient material is always used between the rail and a concrete tie.

As to crossties, timber has been used for them almost from the beginning, and it is still the most common material for this purpose. The modern wood crosstie is treated with preservative chemical to improve its life, the average life of sleepers on main-line railroads is about 35 years. The cost of wood ties has risen steadily, creating interest in ties of other materials. Steel ties have long been used in certain European, African, and Asian countries. Concrete ties, usually reinforced with steel rods or wires, have been gaming in popularity, as have ties consisting of concrete blocks joined by steel spacing bars. A combination of concrete ties and long welded rails produces an exceptionally solid and smooth-riding form of track.

CONVENTIONAL TRACK STRUCTURES

Notwithstanding modern technical developments, the overwhelmingly dominant track form worldwide consists of flat-bottom steel rails supported on timber or pre-stressed concrete sleepers (railroad ties in the US), which are themselves laid on crushed stone ballast. Sections through railway track and foundation show how the ballast and layers are formed. The layers are slightly sloped to help drainage. Most railroads with heavy traffic use continuously welded rails supported by sleepers (ties) attached via base plates which spread the load. A plastic or rubber pad is usually placed between the rail and the tie plate where concrete sleepers (ties) are used. The rail is usually held down to the sleeper (tie) with resilient fastenings, although cut spikes are widely used in North American practice. Timber sleepers (ties) are of many available timbers, and are often treated with creosote, copper-chrome-arsenic, or other wood preservative. Pre-stressed concrete sleepers are often used where timber is scarce and where tonnage or speeds are high. Steel is used in some applications. A disadvantage of traditional track structures is the heavy demand for maintenance, particularly surfacing (tamping) and lining to restore the desired track geometry and smoothness of vehicle running. Weakness of the sub-grade and drainage deficiencies also lead to heavy maintenance costs. This can be overcome by

using ballastless track (slab track). In its simplest form this consists of a continuous slab of concrete (like a highway structure) with the rails supported directly on its upper surface (using a resilient pad).

The technology of rail tracks developed over a long period, starting with primitive timber rails in mines in the 17th century. Cross-sections of flat-bottomed rail, which can rest directly on the sleepers, and bullhead rail which sits in a chair. Hot rolled steel in the profile (cross section) of an asymmetrical I-beam is usually used as the surface on which railway wheels run. Unlike some other uses of iron and steel, railway rails are subject to very high stresses and have to be made of very high-quality steel alloy. It took many decades to improve the quality of the materials, including the change from iron to steel. The heavier the rails and the rest of the track-work, the heavier and faster the trains the track can carry. Profiles of rail include: bullhead rail, grooved rail, vignoles rail (flat-bottomed rail), flanged T rail, fridge rail (inverted U), barlow rail (inverted V).

CONVENTIONAL & PROMISING TRACK STRUCTURES

For much of the 20th century, rail track used softwood timber ties and jointed rails, and considerable extents of this track type remains on secondary and tertiary routes. The rails were typically of flat bottom section fastened to the ties with dog-spikes through a flat tie-plate in North America and Australia, and typically of bullhead section carried in cast iron chairs in British and Irish practice.

Jointed rails were used, at first because the technology did not offer any alternative. However the intrinsic weakness in resisting vertical loading results in the ballast support becoming depressed and a heavy maintenance workload is imposed to prevent unacceptable geometrical defects at the joints. The joints also required to be lubricated, and wear at the fishplate (joint bar) mating surfaces needed to be rectified by shimming. For this reason jointed track is not financially appropriate for heavily operated railroads.

A disadvantage of traditional track structures is the heavy demand for maintenance, particularly surfacing (tamping) and lining to restore the desired track geometry and smoothness of vehicle running. Weakness of the sub-grade and

drainage deficiencies also lead to heavy maintenance costs. This can be overcome by using ballastless track (slab track). In its simplest form this consists of a continuous slab of concrete (like a highway structure) with the rails supported directly on its upper surface (using a resilient pad).

Most modern railways use continuous welded rail (CWR), sometimes referred to as ribbon rails. In this form of track, the rails are welded together by utilising flash butt welding to form one continuous rail that may be several kilometres long, or thermit welding to repair or splice together existing CWR segments. Because there are few joints, this form of track is very strong, gives a smooth ride, and needs less maintenance; trains can travel on it at higher speeds and with less friction. Welded rails are more expensive to lay than jointed tracks, but have much lower maintenance costs. The first welded track was used in Germany in 1924 and the US in 1930 and has become common on main lines since the 1950s.

RAIL IN TRACK STRUCTURE

The modern railroad has a flat bottom, and its cross section is much like an inverted T. An English engineer, Charles Vignoles, is credited with the invention of this design of rail in the 1830s. A similar design was also developed by Robert L. Stevens, president of the Camden and Amboy Railroad in the United States. Present-day rail is, in appearance, very similar to the early designs of Vignoles and Stevens. Actually, however, it is a highly refined product in terms of both engineering and metallurgy. Much study and research have produced designs that minimize internal stresses under the weight of traffic and thus prolong rail life. Sometimes the rail surface is hardened to reduce the wear of the rail under extremely heavy cars or on sharp curves. After they have been rolled at the steel mills, rails are allowed to cool slowly in special boxes. This controlled cooling minimizes internal shatter cracks, which at one time were a major cause of broken rails in track. In Europe a standard rail length of 30 metres is common. The weight of rail, for main-line use, is from about 45 kilograms per metre to 75 kilograms per metre. British Railways use a flat-bottomed rail weighing 55 kilograms per metre. Railroads in the United States and Canada have used T-rails of hundreds of different cross- sections. Many of these different sections are still in use, but there is a strong trend to

standardize on a few sections. The standard American rail section has a length of about 12 metres.

One of the most important developments is the welding of standard rails into long lengths. This continuous welded rail results in a smoother track requiring less maintenance. The rail is usually welded into lengths of about 400 metres. Once laid in track, these quarter-mile lengths are often welded together in turn to form rails several miles long without a break. Welded rail was tried for the first time in the 1930s. But only in the 50s welding rails became a widely accepted practice. By 1971 virtually all new rail, and much old rail taken up and re-laid in new locations, was being laid in welded lengths. For the welding of long rails, European railways rely mainly on the flash-butt process in the plant and on the thermal process in the field. Meanwhile the common practice in Japan is the coupled use of the flash-butt and arc welding process, or use of the gas pressure welding in the field. The advantages of fewer joints provided by long-welded rails are so great that the practice of joining the rails together by welding has acquired the wide-world recognition. Welding the ends of adjacent rails overcomes many of disadvantages of long rails, particularly those of manufacturing and handling.

CONTINUOUS WELDED RAIL (1)

Most modern railways use continuous welded rail (CWR), sometimes referred to as ribbon rails. In this form of track, the rails are welded together by utilizing flash butt welding to form one continuous rail that may be several kilometres long. Because there are few joints, this form of track is very strong, gives a smooth ride, and needs less maintenance; trains can travel on it at higher speeds and with less friction. Welded rails are more expensive to lay than jointed tracks, but have much lower maintenance costs. The first welded track was used in Germany in 1924 and the US in 1930 and has become common on main lines since the 1950s.

The preferred process of flash butt welding involves an automated track-laying machine running a strong electrical current through the touching ends of two unjoined pieces of rail. The ends become white hot due to electrical resistance and are then pressed together forming a strong weld. Thermite welding is used to repair or splice together existing CWR segments. This is a manual process requiring a reaction

crucible and form to contain the molten iron. Thermite-bonded joints are seen as less reliable and more prone to fracture or break. If not restrained, rails would lengthen in hot weather and shrink in cold weather. To provide this restraint, the rail is prevented from moving in relation to the sleeper by use of clips or anchors. Attention needs to be paid to compacting the ballast effectively, including under, between, and at the ends of the sleepers, to prevent the sleepers from moving. Anchors are more common for wooden sleepers, whereas most concrete or steel sleepers are fastened to the rail by special clips that resist longitudinal movement of the rail. There is no theoretical limit to how long a welded rail can be. However, if longitudinal and lateral restraint are insufficient, the track could become distorted in hot weather and cause a derailment. Distortion due to heat expansion is known in North America as sun kink, and elsewhere as buckling. In extreme hot weather special inspections are required to monitor sections of track known to be problematic.

After new segments of rail are laid, or defective rails replaced (welded-in), the rails can be artificially stressed if the temperature of the rail during laying is cooler than what is desired. The stressing process involves either heating the rails causing them to expand, or stretching the rails with hydraulic equipment.

CONTINUOUS WELDED RAIL (2)

Welded rails are more expensive to lay than jointed tracks, but have much lower maintenance costs. The first welded track was used in Germany in 1924 and the US in 1930 and has become common on main lines since the 1950s. Attention needs to be paid to compacting the ballast effectively, including under, between, and at the ends of the sleepers, to prevent the sleepers from moving. Anchors are more common for wooden sleepers, whereas most concrete or steel sleepers are fastened to the rail by special clips that resist longitudinal movement of the rail.

There is no theoretical limit to how long a welded rail can be. However, if longitudinal and lateral restraint are insufficient, the track could become distorted in hot weather and cause a derailment. After new segments of rail are laid, or defective rails replaced (welded-in), the rails can be artificially stressed if the temperature of the rail during laying is cooler than what is desired. The stressing process involves

either heating the rails causing them to expand, or stretching the rails with hydraulic equipment. They are then fastened (clipped) to the sleepers in their expanded form. This process ensures that the rail will not expand much further in subsequent hot weather. In cold weather the rails try to contract, but because they are firmly fastened, cannot do so. In effect, stressed rails are a bit like a piece of stretched elastic firmly fastened down.

CWR rail is laid (including fastening) at a temperature roughly midway between the extremes experienced at that location. (This is known as the "rail neutral temperature"). This installation procedure is intended to prevent tracks from buckling in summer heat or pulling apart in winter cold. In North America, because broken rails (known as a pull-apart) are typically detected by interruption of the current in the signalling system, they are seen as less of a potential hazard than undetected heat kinks.

Joints are used in continuous welded rail when necessary, usually for signal circuit gaps. Instead of a joint that passes straight across the rail, the two rail ends are sometimes cut at an angle to give a smoother transition. In extreme cases, such as at the end of long bridges, a breather switch (referred to in North America and Britain as an expansion joint) gives a smooth path for the wheels while allowing the end of one rail to expand relative to the next rail.

TRACK BALLAST

Track ballast forms the track bed upon which railroad ties (sleepers) are laid. It is packed between, below, and around the ties. It is used to bear the load from the railroad ties, to facilitate drainage of water, and also to keep down vegetation that might interfere with the track structure. This also serves to hold the track in place as the trains roll by. It is typically made of crushed stone, although ballast has sometimes consisted of other, less suitable materials, for example burnt clay. The term "ballast" comes from a nautical term for the stones.

The appropriate thickness of a layer of track ballast depends on the size and spacing of the ties, the amount of traffic on the line, and various other factors. Track ballast should never be laid down less than 150 mm (5.9 inches) thick; and high-

speed railway lines may require ballast up to ½ metre (19.7 inches) thick. An insufficient depth of ballast causes overloading of the underlying soil, and in unfavourable conditions overloading the soil causes the track to sink, usually unevenly. Ballast less than 300 mm (11.8 inches) thick can lead to vibrations that damage nearby structures. However, increasing the depth beyond 300 mm (11.8 inches) adds no extra benefit in reducing vibration.

In turn, track ballast typically rests on a layer of small crushed stones: the sub-ballast. The sub-ballast layer gives a solid support for the top ballast, and reduces the seepage of water from the underlying ground. Sometimes an elastic mat is placed on the layer of sub-ballast and beneath the ballast, thereby significantly reducing vibration. It is essential for ballast to be piled as high as the ties, and for a substantial "shoulder" to be placed at their ends; the latter being especially important, since this ballast shoulder is the main restraint of lateral movement of the track. The ballast shoulder always should be at least 150 mm (5.9 inches) wide, and may be as wide as 450 mm (17.7 inches).

Ballast must be irregularly shaped to work properly. The shape of the ballast is also important. Stones must be irregularly cut, with sharp edges, so that they properly interlock and grip the ties in order to fully secure them against movement; spherical stones cannot do this. In order to let the stones fully settle and interlock, speed limits are often lowered on sections of track for a period of time after new ballast has been laid.

MAINTENANCE OF BALLAST (1)

Ballast must be irregularly shaped to work properly. The shape of the ballast is also important. Stones must be irregularly cut, with sharp edges, so that they properly interlock and grip the ties in order to fully secure them against movement; spherical stones cannot do this. In order to let the stones fully settle and interlock, speed limits are often lowered on sections of track for a period of time after new ballast has been laid. New track ballast is placed at the Boxmeer railway station, The Netherlands. A ballast regulator shaping newly placed ballast. Ballast tamping machine was used in railroad track maintenance (Dade City, Florida).

If ballast is badly fouled, the clogging will reduce its ability to drain properly; this, in turn, causes more debris to be sucked up from the sub-ballast, causing more fouling. Therefore, keeping the ballast clean is essential. Bioremediation can be used to clean ballast.

It is not always necessary to replace the ballast if it is fouled, not all the ballast must be removed if it is to be cleaned. Removing and cleaning the ballast from the shoulder is often sufficient, if shoulder ballast is removed to the correct depth. While this job was historically done by manual labour, this process is now, like many other railway maintenance tasks, a mechanized one, with a chain of specially-designed railroad cars handling the task. One wagon cuts the ballast and passes it via a conveyor belt to a cleaning machine, than the cleaning wagon washes the ballast, and deposits the dirt and ballast into other wagons for disposal and re-use, respectively. Such machines can clean up to two kilometres (1.2 mi) of ballast in an hour. Cleaning, however, can only be done a certain number of times before the ballast is damaged to the point that it cannot be re-used; furthermore, track ballast that is completely fouled cannot be corrected by shoulder cleaning. In such cases, it is necessary to replace the ballast altogether. One method of “replacing” ballast, if necessity demands, is to simply dump fresh ballast on the track, jack the whole track on top of it, and then tamp it down; alternatively, the ballast underneath the track can be removed with an under cutter, which does not require removing or lifting the track.

MAINTENANCE OF BALLAST (2)

If ballast is badly fouled, the clogging will reduce its ability to drain properly; this, in turn, causes more debris to be sucked up from the sub-ballast, causing more fouling. Therefore, keeping the ballast clean is essential. It is not always necessary to replace the ballast if it is fouled, not all the ballast must be removed if it is to be cleaned. Removing and cleaning the ballast from the shoulder is often sufficient, if shoulder ballast is removed to the correct depth.

The dump and jack method cannot of course be used through tunnels, under over bridges, and where there are platforms. Where the track is laid over a swamp, such as

the Hexham swamp in Australia, the ballast continuously sinks, and needs to be topped up to maintain its line and level. After 150 years of topping up, there appears to be 10 m (33 ft) of sunken ballast under the tracks. Chat Moss in the United Kingdom is similar. Regular inspection of the ballast shoulder is important; as noted earlier, the lateral stability of the track depends upon the shoulder. The shoulder acquires some amount of stability over time, being compacted by traffic; maintenance tasks such as replacing ties, tamping, and ballast cleaning can upset this stability. After performing these tasks, it is necessary for either trains to run at reduced speed on the repaired routes, or to employ machinery to compact the shoulder again.

If the track bed becomes uneven, it is necessary to pack ballast underneath sunk ties to level the track out again. This is, in the mechanized age, usually done by a ballast tamping machine. A more recent, and probably better, technique is to lift the rails and ties, and to force stones, smaller than the track ballast particles and all of the same size, into the gap. This has the advantage of not disturbing the well-compacted ballast on the track bed, as tamping is likely to do. This technique is called pneumatic ballast injection (PBI), or, less formally, "stone-blowing". However, this technique is not as effective with fresh ballast, as the smaller stones tend to move down between the larger pieces of ballast. It is essential for ballast to be piled as high as the ties, and for a substantial "shoulder" to be placed at their ends; the latter being especially important, since this ballast shoulder is the main restraint of lateral movement of the track.

TRACK MAINTENANCE (1)

Ideally, a railroad should be built in a straight line, over level ground, between large centres of trade and travel. In practice, this ideal is rarely approached. The location engineer, faced with the terrain to be traversed, must balance the cost of construction against manual maintenance and operating costs, as well as against the probable traffic volume and profit.

Thus, in areas of dense population and heavy industrial activities, the railroads were generally built for heavy duty, with minimum grades and curvature, heavy bridges, and perhaps multiple tracks. Examples include most of the main-line

railroads of Britain and the European countries. In North and South America, and elsewhere, the country was sparsely settled, and the railroads had to be built at minimal costs. Thus, the lines were of lighter construction, with sharper grades and curves. As traffic grew, main routes were improved to increase their capacity and to reduce operating costs. The advent of modern high-capacity earth-moving machinery, developed mainly for highway construction, has made it economically feasible for many railroads to eliminate former adverse grades and curves through line changes. Modern machinery enables a small group of men to maintain a relatively long stretch of railroad track. Machines are available to do all the necessary track maintenance tasks: removing and inserting ties, tamping the ballast, spiking rails, tightening bolts, and aligning the track. Mechanized equipment also can renew rail, either in conventional bolted lengths or with long welded lengths; cranes are used to remove the old rail and lay the new.

Complete sections of track – rails and crossties – may be prefabricated and laid in the track by mechanical means. Rail-grinding machines run over the track to even out irregularities in the rail surface. Track-measurement cars, under their own power or coupled into regular trains, can record all aspects of track alignment and riding quality on moving charts, so that maintenance forces can pin-point the specific locations needing corrective work. Detector cars move over the main-line tracks at intervals with electronic-inspection apparatus to locate any internal flaws in the rails.

The mechanization of track maintenance after World War II has constituted a technologic revolution comparable to the development of the diesel locomotive and electrification, hi Europe in particular, highly sophisticated maintenance machines have come into use.

MECHANISATION

The active processes of mechanisation of track works have started soon after World War II. But engineers didn't need too much time to understand all advantages brought by applying various track maintenance machines. It is quite obvious that comparing with savings received from the mechanisation the conventional order of track works – "to go and to find" based on frequent expeditions of track teams proved to be miserable. Modern mechanisation programs adopted by many European

railways are intended to reduce as much as possible manual labour and replace it by various machines and mechanisms.

Besides its fund-saving tendency, mechanisation also provides higher labour quality, less physical efforts of workers, higher productivity, and possibility to reduce manpower. Nevertheless, though strange it can sound, mechanisation is not always a justified replacement for manual labour. So in any concrete case it is necessary to study conditions in which machines are to be used, taking into account not only the need to accelerate track works but also their economic approvement.

Speaking about mechanisation, one should note a number of track maintenance aspects for which introducing machines is of particular importance. First of all, it refers to works requiring intensive muscle efforts. Equipment used today at the railways has simplified radically operations with long-welded rails, concrete sleepers, assembled switch sets and level crossings as well as works with old and new ballast. At present labour legislation has much more severe limitations for carrying hard materials than it was previously. And railways have to follow strictly all these legal requirements. Mechanisation, while using light track maintenance machines (for example, cranes for moving rails) or mechanisms with harmful effect on man's health (vibration, noise, etc.), has changed the character of track works and the image of a railway worker. Many machines today are equipped with air-conditioning, are sound-proof, with reduced vibration impact and ergonomical design. On the other hand, applying new mechanisms has resulted in considerable reduction of accidents.

Besides the benefits brought by mechanisation to railway personnel, it has influenced the whole railway's efficiency. The cost of track works has been reduced and is being reduced, though research and design works require great capital investments. Computerisation having been introduced at railways, some machines are equipped with special devices able to perform self-inspection of the works done.

THE RAILROAD TRACK OF TODAY

The track is, in fact, the basic feature of a railway. The two-century-long progress of railways changed not only locomotives and cars, but the track as well.

Sleepers support rails and ballast supports sleepers. Sleepers on most tracks were almost all of wood treated with creosote for longer life. Now concrete is

considered to be the ideal material for railway sleepers. Concrete sleepers have a far greater weight than wooden ones and thus provide greater stability of track and higher speeds. Sleepers rest upon a bed of crushed rock or gravel, which is called ballast. Ballast is a very important element of the track for it is the ballast that supports the track structure, holds the track in position and provides the needed drainage. Some railways have two or more tracks. In order to make trains pass from one track to another railways have a switch, which is a very important element of the track.

Since the railroad beginning, the track structure has been substantially improved. One of the greatest improvements was the elimination of rail joints – the weakest part of the track. In order to reduce the number of joints rails are welded into continuous lengths. Most main lines in Europe are constructed with continuous welded rail (CWR). CWR has greater strength, provides a smoother running of trains at far greater speeds and reduces maintenance costs. One of its noticeable effects – for passengers at least – is the elimination of the characteristic clickety-clack sound as the train crosses rail joints.

Another recent improvement is the use of ballastless track for new high-speed and heavy freight lines. More and more countries replace traditional ballasted track with the so-called slab track. The principle is based on a completely new way of thinking in railway construction. Sleepers, fastenings and ballast bed are not needed because of the concrete slab superstructure with embedded rails. The slab track has more advantages over ballasted track in terms of maintenance. Simple ballasted track needs continuous investment in track machines, equipment and manpower. Problems with ballast bed may occur where trains operate at speeds above 250 km/h whereas balastless slab track has higher levels of safety, high precision, low life-cycle cost, ease of replacement, and short installation time. Therefore slab track is justly considered to be the track for the future.

CASE STUDY 05
RAILWAY CIVIL ENGINEERING

Do the following assignments to text abstract determined by your language supervisor as that for you to be analyzed individually

1. Write out of the text abstract all the Subjects. Analyze them and classify the means to express the Subject in English language.
2. Write out of the text abstract all the Predicates. Analyze them and classify the means to express the Predicate in English language.
3. Write out of the text abstract all the Objects. Analyze them and classify the means to express the Object in English language.
4. Write out of the text abstract all the Attributes. Analyze them and classify the means to express the Attribute in English language.
5. Write out of the text abstract all the Adverbial Modifiers. Analyze them and classify the means to express the Adverbial Modifier in English language.
6. Write out of the text abstract all the modal verbs. Explain their meanings and the ways to express English verb modality by means of Ukrainian language.
7. Write out of the text abstract all the Grammar structures having no Ukrainian equivalents. Explain the ways to translate such structures by means of Ukrainian language.
8. Write out of the text abstract all the abbreviations; give their non-contracted equivalents, compare the translations of the abbreviations to their non-contracted equivalents. Analyze the text abstract on the availability of non-contracted word combinations having generally-used abbreviations.
9. Write out of the text abstract all the international lexis; give their Ukrainian equivalents. Analyze the text abstract on the availability of Ukrainian words having generally-used international equivalents.
10. Write out of the text abstract all the “false friends of a translator”; give their proper meanings. Explain where it is possible the differences or peculiarities in the

meanings of the analyzed words. Explain the rules of choosing the proper lexical unit while translating.

11. Write out of the text abstract all the words used in their figural meaning; give their direct meaning. Explain the reasons of their using in a figural meaning.

12. Translate the following text abstract using available academic or electronic dictionaries (Multitran, Prompt etc.).

13. Make a plan of the text abstract.

14. Compile a vocabulary to the read and translated text abstract.

15. Compile a glossary of terms with their explanation in English to the analyzed text abstract.

RAILWAY CIVIL ENGINEERING

The track is the basic feature of a railway. But there must be also various kinds of buildings as well as tunnels, bridges, viaducts and other engineering structures which enable the railways to perform their job successfully. The railway buildings we are familiar with include station buildings, goods yards and depots. There is no need to say that all of them must be sufficiently strong and outwardly attractive. Railway buildings being subjected to intensive vibration and noise, these factors should be taken into account at the initial stage of construction. So nowadays collaboration must exist between engineers and architects in the designing and construction of different types of buildings in order to meet various needs of railway service and to make the buildings aesthetically satisfying. It is quite obvious that the outward appearance of railway stations is not of minor importance. Steam traction with its attendant smoke and dirt having been replaced by diesel and electric traction, the problem of maintaining railway buildings was greatly facilitated. The new materials we extensively use today for finishes also contribute to the attractiveness of railway stations. On the other hand, a wide of such materials as plastics and particularly glass sometimes increases substantially the maintenance cost of buildings. So particular attention should be given to the selection of proper materials for finishes.

The designing of a station building for a large city is a very complicated job for civil engineers and architects since this building should be regarded, above all, as part of the city's public centre. So, on the one hand, its architectural design must be in line with the style of the surrounding buildings. On the other hand, however, strict limitations are imposed on any project of this kind by track layout and other needs of railway service. Other problems the architects and the builders face have much in common with the problems encountered by all civil engineers. Nowadays, the process of construction is being increasingly mechanised. The replacement of hard manual labour by machines enables the builders to carry out the work speedily and makes their work much easier. Besides, a high level of mechanisation makes it possible to perform the work with less manpower. The need to speed up the work of construction often calls for the application of prefabricated parts of buildings. Wide use of prefabricated units is also made of in the erection of railway substations as well as structures to carry contact wires for electric railways.

TECHNICAL AIDS AT SWITCHING YARDS

Railways have always been pioneers in introduction of improved methods of control. Today various technical aids are widely used for operations in switching yards. In such yards freight cars from many different origins are sorted out and placed in new trains going to the appropriate destinations. Modern classification yards apply radio, telephone, teleprinter, pneumatic tube, and closed-circuit television. The radio saves much time thanks to constant and direct communication between the engine driver and the operators on duty. The sorting of goods trains and separate cars is now unthinkable without radio. A car inspector, having found a damaged car, uses the walkie-talkie, this individual radio device, to call other workers for help. The TV installations are applied for inspecting cars, while moving over the hump. "Hump" is a typical feature of most large classification yards. Cars are pushed over it, then they roll down by gravity and each is routed into a classification or "bowl" track corresponding to its destination. Some time ago, when the train arrived at the switching yard, a man had to walk along the train, checking car after car. Now an operator sitting just in the office can watch a long line of cars directly on the

television screen and check them off comfortably and accurately. Repair shops adjacent to the yards are designed for quick and mechanized repair of cars found to be defective.

By the early 1970s operations in the newer classification yards had reached a high degree of automation. The heart of such a yard is a computer, into which the information concerning all cars in the yard or en route to it is fed. As the cars are pushed up the hump, electronic scanners confirm their identity by means of a light-reflective label, place the data (car owner, number, and type) in a computer, and then set switches to direct each car into the proper bowl track. Electronic speed-control equipment measures such factors as the weight, speed, and rolling friction of each car and operates electric or electro-pneumatic "retarders" to control the speed of each car as it rolls down from the hump. Every phase of the yard's operations is monitored by a computerized management control and information system. Because such electronically equipped yards can sort cars with great efficiency, they eliminate the need to do such work at other, smaller yards. Thus, one large electronic yard may permit the closing or curtailing of a dozen or more other yards. Most modern electronic yards have quickly paid for themselves out of operating savings – and this takes no account of the benefits of improved service to shippers.

RAILWAYS AUXILIARY PLANTS

Railroad fixed plant consists of much more than the track. While constructing railways, civil-engineering forces are concerned with constructing and maintaining thousands of buildings, ranging from switch tenders' shanties to huge passenger terminals. The designer of a railroad bridge must allow for forces that result from the concentrated impact that occurs as a train moves onto the bridge: the pounding of wheels, the side-way of the train, and the drag or push effect as a train is braked or started on a bridge. These factors mean that a railroad bridge must be of heavier construction than a highway bridge of equal length. As freight-train loads become heavier and train speeds higher, bridges need to be further strengthened. Another major objective in modern railroad-bridge construction is the need to minimize maintenance costs. The use of weathering steel, which needs no painting, all-welded

construction, and permanent walkways for maintenance personnel contribute to this end. In the advanced countries there has been a widespread trend toward replacing timber trestles with concrete-slab structures or with concrete or steel-pipe culverts. The railroads also have sought ways to mechanize the maintenance of their bridges. Railroad buildings in the 20th century have become fewer and more functional. With paved highways running almost everywhere in the developed countries, it has become more economical to concentrate both freight and passenger operations on a fewer but larger, strategically located stations. Only a few really modem passenger stations have been built.

Diesel and electric locomotives require few maintenance shops as compared with steam locomotives. Diesel shops are of three main types: small fuelling, sanding, and light-maintenance centres at points where runs end or locomotives are changed; intermediate-maintenance shops, usually serving a region, that perform certain route inspection and maintenance tasks, and heavy-repair shops, where locomotives undergo extensive repairing or rebuilding. Car shops, too, have been reduced in number and made more efficient through the use of process-line techniques. Terminal points and major classification yards usually have a shop for light repairs and maintenance of cars; a railroad also usually has one or more heavy-repair shops, where cars are completely overhauled or where new cars are manufactured.

BRIDGE BUILDING

Streams and rivers have always been obstacles in the way of man's travel and people had to overcome these obstacles by erecting bridges, these remarkable examples of civil engineering. Nobody knows when the first bridge was built and when the idea of throwing a log over a stream came to a pre-historic man. Most probably a tree blown by the wind happened to fall across a stream and thus suggested the bridge idea accidentally. Sometimes the swift rivers washed away the soil and stone thus forming natural bridges. In tropical countries, lianas growing from one tree to another formed natural suspension bridges used by a traveller for getting across a river or a stream.

Modern bridges are of several types. Actually there are only three basic types of bridges, the beam or the girder bridge, the suspension bridge and the arch bridge, these three having developed some different forms in the course of time. The simplest and the oldest type of bridge is the beam bridge, its prototype being a fallen tree or a log laid across a stream or a valley. Some of the beam bridges have a single span or beam while others have a lot of spans. The end of each span rests on concrete piers rising from the bed of the river, the end spans being laid on the river banks. Most of the larger bridges are complicated steel structures, many smaller ones being made of reinforced concrete. The most interesting type seems to be a suspension bridge. This bridge consists of two towers built on the opposite banks of a river or a valley and used as supports for cables. A roadway, often double-deck, is suspended from the cables by means of vertical connections. The arch bridge seems to be the most beautiful type. Arches do not simple rest on piers as beams. They are constantly pushing outward against their supports or abutments, producing what is known in structural mechanics as thrusts.

Nowadays bridge engineering is closely connected with other engineering sciences and applied mathematics. The advances in other branches of science have necessitated the advances in the science of bridge building. Bridges have played a great part in the development of railroading. In some countries many miles of railroad track do not touch the ground for they are laid on bridge structures. And the development of the railways has influenced the art of bridge building necessitating the erection of stronger bridges, and the replacement of existing ones by the structures of increased strength and carrying capacity.

TUNNELS

Although very expensive, tunnelling provides the most economical means for railroads to traverse mountainous terrain or to gain access to the heart of the crowded city. Nowadays tunnels have also joined parts of cities, countries and even continents separated by water, as the famous Euro-Tunnel between France and Great Britain. Railroad tunnels, however, confront the construction engineer with some unique problems, particularly in the ventilation of runnels on lines that are not electrified.

The first steps of railways were associated with extensive tunnel construction. The early engineers hesitated to adopt the steeper inclines and sharper curves which became the practice in our days. Though the builders followed nature m creating underground passages, it soon became clear that man-made subterranean passages had to go through softer soils, requiring at the same substantial supports. The search for minerals of various lands led to the driving of long underground passages and as they had frequently to penetrate through strata of soft and yielding character, strong timber frame work had to be introduced to afford stability. But this timbering was sufficient only for temporary purposes and was soon replaced by masonry side walls. In constructing modern tunnels before deciding the actual location of a tunnel, both as to line and level, it is necessary to obtain the most reliable data possible regarding the strata through which it has to pass. Geological indication boring is made, and trial holes showing the respective layers of materials are cut.

Previously tube tunnels have been lined with bolted cast iron segments built inside a shield and with cement grout forced into the space left as the shield moves. The idea of shield was proposed by a celebrated engineer Mark Brunnel, while building the first tunnel of London Underground going beneath the Thames. Although reliable, this method is slow and more expensive. The various railway tunnels under the Hudson and East rivers in New York were driven by shields, and usually considerable quantities of concrete were set outside the tunnel lining. The vast network of tunnels of the Paris Metropolitan was not made with the aid of shields. The tunnels under the river were made by using caissons in conjunction with cofferdams and the tunnels themselves made of concrete, two tracks wide. In firm ground the tunnels are usually excavated by using supports to keep roof and walls in place while the concrete is setting. Rotary type of the shield with conveyers to remove the soil is used to construct tunnels in good clay.

TRAIN STATION

A train station, or railroad station (AE), or railway station (BE), is a point of call for trains, allowing the loading or unloading of goods, or allowing passengers to board and alight. Early stations were usually built with both passenger and goods

facilities. This dual purpose is less common today, and in many cases goods facilities are restricted to major stations. Generally stations are sited next to a railway or railroad line, or form the terminus for a particular route. Usually platforms are present to allow passengers to access trains easily and safely. Platforms may be connected by subways, bridges, or level crossings to the main part of the station; passenger facilities such as shelter, ticket sales, waiting rooms and benches are partly there, partly on the platforms. The term station stop is used to differentiate a stop for a station from a stop for another reason, such as an engine change. As well as providing services for passengers and loading facilities for goods, stations often had locomotive and rolling stock depots (including refuelling, sidings and sheds). A train station that is jointly used by several rail transport companies is sometimes called a union station, or an interchange station. Train stations collocated with other transport systems such as trams and buses may also be referred to as interchanges, as may stations offering both metro/subway and heavy rail services.

The first train stations resembled tram stops, with little in the way of buildings or facilities. The first railway stations in the modern sense were on the Liverpool and Manchester Railway, opened in 1830. Today Liverpool Road station is preserved as part of the Museum of Science and Industry in Manchester. It resembles a row of Georgian houses. Many train stations date from the 19th century and reflect the architecture of the time, grand in scale and size, lending prestige to the city as well as to railway operations. They also reflect the hubris of the time. Other countries, where railways arrived later, may still have such architecture, as later stations often imitated 19th century styles. Various forms of architecture have been used in the construction of railway stations, from those boasting grand and intricate almost baroque-style edifices, to more stark utilitarian or modern styles. Stations built more recently often have a similar feel to airports, with a cold and plain abstract style.

MODERN TRAIN STATION

Examples of modern stations include those on newer high-speed rail networks, such as the Shinkansen in Japan and LGV lines in France. Britain boasts a new modern rail terminus at Waterloo International, the end-point for the Eurostar

Channel Tunnel rail services to France and Belgium. This station will cease to be the Eurostar terminal when the new St. Pancras terminal, connected to the Channel Tunnel high-speed rail link, opens in 2007.

The world's busiest train station, in terms of daily passenger throughput, is Shinjuku Station in Tokyo, Japan. Ikebukuro Station, just minutes away, is the world's second-busiest. By train throughput, the world's busiest train station is Clapham Junction in London. The world's largest train station, in terms of floor area, is Nagoya Station in Nagoya, Japan. However, the Nagoya Station complex incorporates two office towers and an underground shopping concourse, so the railway terminal itself is not large in comparison to others. Shinjuku Station is the second largest. In terms of platform capacity, the world's largest train station is Grand Central Terminal in New York City, USA.

A terminus is a station sited where a railway line ends or terminates. Thus, platforms can be reached without crossing tracks. Often a terminus is the final destination of a train, but not necessarily. When a train is required to travel onwards from a terminus, it must reverse out of the station to continue the trip. Various methods exist to counter this problem. The same applies if the station is not a terminus, but the train service involves reversing direction anyway. Reversing direction often causes some worry to travellers who are inexperienced and have no detailed geographic knowledge of the railway lines – one might assume the train has finished its journey and is returning to the starting location. Some travellers prefer facing forward; if possible they change place when there is a reversal of direction. In some types of carriages, train personnel are able to turn the seats when the train changes direction so that all travellers face forward.

STATION FACILITIES

Train stations usually include either ticket booths, or ticket machines. Ticket sales may also be combined with customer service desks or convenience stores. Many stations include some form of convenience store. Larger stations usually have fast-food or restaurant facilities. In some countries, such stations also have a bar, or pub. Other station facilities include: toilets, left-luggage, lost-and-found, departures and

arrivals boards, luggage carts, waiting rooms, taxi ranks and bus bays. Larger or manned stations tend to have a greater range of facilities. A most basic station might only have platforms, though it would still be distinguished from a halt, a stopping or halting place that may not even have platforms.

The modern non-terminus Lewes Station in East Sussex, England serves trains passing through the station. Passengers reach the island platform (on right) by a pedestrian footbridge. In addition to the basic configuration of a train station, various features set certain types of station apart. The first is elevation. While most stations are at ground level, those in cities or urban areas are often elevated or situated below ground, even if the station is not necessarily part of an underground metro system. The reason is usually to grade-separate road systems. Elevated stations are more common, not including metro stations.

Another unusual configuration is where the station serves railway lines at differing levels. This may be due to the station's situation at a point where two lines cross, or may be to provide separate station capacity for two types of service, e.g. intercity and suburban, or simply two different destinations. Some stations have unusual platform layouts, due to space constraints of the station location, or the alignment of the railway lines. Examples are non-parallel platforms and curved stations (and platforms). Accessibility for people with disabilities is important in train station design and mandated by law in some countries. Considerations include: elevator or ramp access to all platforms, matching platform height to train floors, making wheelchair lifts available when platforms do not match vehicle floors, accessible toilets and pay phones, audible station announcements, safety measures such as tactile marking of platform edges and covering of third rail.

FROM THE HISTORY OF KYIV RAILWAY STATION (1)

In 1870 the construction of Kyiv-Balta and Kyiv-Kursk railway lines was finished. That year set the beginning of Southern-Western railways. In 1868-1870 near the present Railway square in the Lybid-river valley in the place of "soldier gendarme sites" a station of Kyiv-Balta railway was constructed as well as the first Kyiv railway station (now it is Kyiv-Passenger railway station), designed by architect

M.V. Vyshnevskyi. It was a two-storied brick building in Old English Gothic. Seven express, mail and mixed goods-and-passenger trains with carriages of classes 1, 2, 3 were received and dispatched every day from the refined pavilion of the railway station. Nearly 25 000 passengers were carried by rail during the first half of the year.

On 11 August 1877 the railway station was vastly damaged in fire and it was in need of repair and reconstruction. The project tasks were worked out by a commission, which consisted of representatives of railways and military department concerned. The Board of Southern-Western railways drew a project of rebuilding of the Kyiv railway junction. The goods station was transferred a considerable distance away from the station Kyiv-1 of those times, on the territory of which different workshops, depots, storehouses and a new railway station building remained. The station Kyiv-1 served as the terminal both of Southern-Western lines and the Society of Kyiv-Voronezh-Moscow railway, where through traffic was absent. That is why the project of a new railway station was made by type of two terminal dead-end-siding railway stations connected together like letter H. In the project the principle of division of passengers according to not only the class but also to directions and arrivals was used. Luggage was carried through specials tunnels situated lower than the floor level of the building and then it was sent up by mechanical lifts to the platforms. The project envisaged a building facing partially with brick, partially with imitated stone in style of Italian Renaissance; inside works with fire-resistant materials such as tile majolica and imitated stone; installation of central heating of low pressure as well as supercharging and drawing out ventilation. Work was planned to begin in 1907. However, the credit was allotted only for construction of a provisional passenger building that was begun in the same year. In 1908 all works were completed.

FROM THE HISTORY OF KYIV RAILWAY STATION (2)

The one-storied wooden building was meant for three-year-long use but it was exploited for nearly a quarter of a century. Till 1913 Kyiv railway junction dispatched 25 long-distance trains and 17 local trains.

In the same year, they began realization of a new project of railway station that

was worked out by a renowned architect from St. Petersburg V.O. Shchuko. The project envisaged that the long-distance trains of all four directions and the local trains of Eastern direction would arrive and leave from Northern lines that were situated parallel to the long axis of the railway station building. The local trains of Western direction would leave from dead-end-siding lines situated to the West from the railway station. The service of passengers was concentrated in the vestibule and two adjoining buildings. To the left and to the right of the vestibule on the ground floor there were luggage halls: on the left side of them - luggage serving out, on the right - luggage sending. The vestibule of arrival comprised a hairdresser's, toilets, cloakroom for hand luggage, information bureau and staircase up to the first floor (to the restaurant in the departure hall). Auxiliary rooms were located on two floors in the right wing of the building. Rooms for newly arrived railway workers and a kitchen with auxiliary premises were located on the second and third floors of two buildings that bordered with the railway station building.

On the 9 April 1913 they began disassembling of the old buildings of the railway station. In 1914 the foundation of the building of railway station was laid but the First World War and the Russian revolution prevented a further construction. In 1925 a scheme of Kyiv railway junction was worked out and a plan of construction of a railway station was drawn. In 1927 the construction of the railway station by a technical project of the Board of Southern-Western railways, as well as by a front project made by professor of architecture O.M. Verbytskyi and architect P.F. Al'oshyn, began. The building, in style of Ukrainian Baroque with elements of Constructivism, began to be exploited in 1932. In 1945 by order of the People's Commissar of Railways General-Lieutenant M.V. Koval'ov, full member of the Academy of Architecture O.M. Verbytskyi was awarded medal "To Honoured Railway Man".

FROM THE HISTORY OF KYIV RAILWAY STATION (3)

During the World War II the building of Kyiv railway station was partially destroyed. Fascists tried to blow up it in the basement, but the reinforcement rolled itself up into a spiral, and the building remained standing. In 1945-1949 the railway

station building was renovated by the project worked out under the supervision of architect H.F. Domashenko. In 1945-1955 an underground passage was laid and it connected the Railway Square with the railway station and platforms. In 1967-1969 a shed over the first platform was erected that was 400 meters long and 13 meters wide and more than 200 meters long, calculated on 1,000 persons. In 1978-1980 the main vestibule of the railway station was reconstructed, and the railway men connected it by its steel main lines with the whole country and many neighbouring countries.

But more considerable reconstruction of the railway station took place just in 2001, initiated by Ukrainian Railways – "Ukrzaliznytsya" – and funded by Ukrainian railway branch. According to the conclusions of specialists of the Research Institute of Constructions and the Institute "Ukrrestoration", the condition of the complex of that time did not satisfy the actual requirements of technological and building planning. A joint sitting of the Board of the Ministry of Railways of Ukraine and the Kyiv City Administration on 11 February 2000 made a decision to build and reconstruct the main objects that included Central, Local and Southern railway stations, as well as the concourse, Western and Eastern tunnels, the church, parking lots, railway network. Requirements of maximal distribution of passenger traffics of departure and arrival without unnecessary crossing of them on one level laid down the foundations of technological principles. The realization of the project resulted in a powerful ramified railway terminal that considerably improved the functional possibilities of the junction and increased its traffic capacity nearly twice as much. Being renovated to the 10th anniversary of Independence of Ukraine, the railway station complex was organically involved into infrastructure of Kyiv. In the reconstruction of the building of Central railway station the walls and columns were reinforced, the overlapping and all engineering systems were substituted. For the first time the system of microclimate was implemented.

RAIL FREIGHT TERMINALS

For the past two years Rail Freight Group in the UK has been focusing on track capacity as the major strategic issue facing freight on rail. With a history of 40 years of decline it is not surprising that many have been sceptical about claims that rail

freight can double or treble within a ten-year horizon. The newly privatized Rail track naturally made cost cutting and rationalization a greater priority than increasing capacity for potential freight growth. However, freight is now growing and there is a gathering momentum and confidence both within and outside the industry that substantial growth is not just possible but likely in the next few years. The issue of track capacity has been tackled on two fronts. Firstly through the regulatory process governing specific projects such as Thames-link 2000 and the Virgin proposals for the West Coast Main Special line (PUG1 and PUG2). And secondly through the beefed up Network Management Statement that, since an amendment to Rail track's license last year, is now enforceable by the Regulator. The Regulator has demanded that freight is fully taken into account in the Statement and that plans for growth are included. Undertakings have effectively been given which require Rail track to deliver capacity ahead of demand and the Regulator has said that where commercial incentives for Rail track to invest in freight capacity are weak he will put in place regulatory incentives. These are likely to be exercised through the network management statement process and the periodic review of access charges.

Many former railway goods facilities are no longer suitable for rail freight and associated activities, others may be of crucial importance. The key criteria for terminal sites vary according to the purpose and scale of the terminal but all must have: 1) good physical road and rail access; 2) an appropriate size and configuration; 3) economic access to rail network services; 4) relevant location vis-a-vis economic activity and canters of demand; 5) compatibility with neighbouring land uses. The train to waste communication medium is currently undergoing a significant evolutionary change towards free air loosy coax or radiax transmission technologies.

TERMINAL CAPACITY – THE NEXT BIG ISSUE

The next big issue for rail freight is terminal capacity. Rail freight can only run on the railway if there are sufficient access points to enable it to get on and off within an economically viable distance of its source and final destination. This means a good coverage of terminals for domestic freight at local level. For longer distance freight, particularly international, a comprehensive regional coverage is required. The number

of business premises with their own rail connection is limited and the scope for new private sidings modest. Most new rail freight will have to be intermodal in the broadest sense, gaining access to the rail network through a terminal whether the freight is unitised in a container, piggyback trailer or swap-body, or whether it is conventionally trans-shipped from road to rail vehicle. The majority of freight in the UK moves over relatively short distances, much within a single economic region. In this context, to make an impact on the freight market and achieve significant growth, rail freight cannot restrict itself to international moves of bulk movements between private sidings. The current network of terminals both regional and local is far from comprehensive and, in a growing .market, short on capacity. There are obvious gaps in South Wales and the South West, Scotland outside the central belt, and in the South East especially west, south and east of London. In other areas there is an immediate need for more terminals notably in London, the North West and the Midlands will also need more terminals in the medium term. In some of these areas developers are seeking to establish new large-scale terminals with rail-connected warehousing and other related activity. Projects include a terminal at Colnbrook adjacent to Heathrow airport being developed by the Argent Group and a terminal at Agecroft, Manchester being developed by Powell Duffryn Storage Other projects at various stages of development at Swindon, Cardiff and Exeter. At the local or sub-regional level many more terminals will be required to serve specific towns, or for specific activities such as waste transfer or recycling, concrete or road-stone manufacture, intermediate storage for the metals trade. Others will be needed to enhance the services available at ports, or to provide *ad hoc* facilities for one-off and short term movements such as timber from maturing forests, delivery of water pipes for periodic replacement of urban facilities, removal of spoil or delivery of building materials of construction projects.

THE PROPERTIES OF BUILDING MATERIALS

Materials that are used for structural purposes should meet several requirements. In most cases it is important that they should be hard, durable, fire- resistant and easily fastened together. The most commonly used materials are steel, concrete,

stone, wood and brick. They differ in hardness, durability and fire-resistance. Wood is the most ancient structural material. It is light, cheap and easy to work. But wood has certain disadvantages: it burns and decays. Stone belongs to one of the oldest building materials used by man. It is characteristic of many properties. They are mechanical strength, compactness, porosity, sound and heat insulation and fire-resistance. The stones usually used for masonry work are as follows: 1) Granite which is very hard, strong and durable. It is used particularly for basement, base courses, columns and steps and for the entire facades. 2) Sandstones are composed of grains of sand or quarts cemented together. Some of them are exceptionally hard and are selected for steps, sills, etc. It is an excellent material for concrete aggregate. 3) Marble is a crystalline stone chiefly used for decorative purposes. White and black marbles are used for ornamental decoration where the beauty of the marble is shown to its best advantage. Bricks were known many thousands of years ago. They are the examples of artificial building materials. Concrete is referred to as one of the most important building materials. Concrete is a mixture of cement, sand, crushed stones and water. Steel has come into general use with the development of industry. Its manufacture requires special equipment and skilled labour. Plastics combine all the fine characteristics of a building material with good insulating properties. It is no wonder that the architects and engineers have turned to them to add beauty to modem homes and offices.

All building materials are divided into three main groups: 1) Main building materials such as rocks and artificial stones, timber and metals. 2) Binding materials such as lime, gypsum and cement. 3) Secondary or auxiliary materials which are used for the interior parts of the buildings. We use many building materials for bearing structures. Binding materials are used for making artificial stone and for joining different planes. For the interior finish of the building we use secondary materials. Natural building materials are: stone, sand, lime and timber. Cement, clay products and concrete are examples of artificial building materials.

BRITISH STATIONS

The station buildings of the first Liverpool & Manchester Railway terminus at Crown Street, Liverpool, were a solid structure and the company lavished money on the celebrated Moorish Arch (shown in so many early prints) across the cutting. The L&MR Manchester terminus at Liverpool Road, part of which remains today, likewise is a solid structure of good design. They were far eclipsed, however, by the Euston terminus (1837) of the London & Birmingham, now, including the world-famous Doric Arch entrance to the forecourt, totally demolished. The site is covered by the new Euston – a structure for which few have much enthusiasm. Although intended to be functional, it is not really modern architecture and many users complain that it is inconvenient. Largely because of lack of common sense in local planning, British Railways was prevented from building a tower block of offices over the terminus, which would have earned money from letting and at the same time eased London street congestion by affording work-places for many commuters who travel to and from Euston by train. In the early days of railways the low platform – or even simply the ground when there were no platforms – was regarded simply as an adjunct to the buildings. Then there came the high platform of carriage floor level, or a little below. Platforms have been a major factor in the design of stations. They necessitate footbridges and pedestrian subways, and should be roofed at least in part where there is no overall roof. Footbridges and "umbrella" and other types of platforms roof alter almost the whole look of stations. How many country stations are characterized by the type (open or roofed) of footbridge? The designs of platform canopy are legion, and one species of railway connoisseur specializes in classifying and identifying canopy styles. There are "split stations" with separate platform for diverging lines and there was long a "double-split" at Ashchurch near Cheltenham. Ambergate in Derbyshire was once a triangular station, with up and down platforms for each of three double-track lines forming the triangle where the Midland's former Manchester (now only to Matlock) line branched off from the main line from Derby to Sheffield. Only the Derby to Matlock line platforms are now used and the others by now are wholly or partially unusable or demolished.

CASE STUDY 06
RAILWAY OPERATION PROVIDING

Do the following assignments to text abstract determined by your language supervisor as that for you to be analyzed individually

1. Write out of the text abstract all the Subjects. Analyze them and classify the means to express the Subject in English language.
2. Write out of the text abstract all the Predicates. Analyze them and classify the means to express the Predicate in English language.
3. Write out of the text abstract all the Objects. Analyze them and classify the means to express the Object in English language.
4. Write out of the text abstract all the Attributes. Analyze them and classify the means to express the Attribute in English language.
5. Write out of the text abstract all the Adverbial Modifiers. Analyze them and classify the means to express the Adverbial Modifier in English language.
6. Write out of the text abstract all the modal verbs. Explain their meanings and the ways to express English verb modality by means of Ukrainian language.
7. Write out of the text abstract all the Grammar structures having no Ukrainian equivalents. Explain the ways to translate such structures by means of Ukrainian language.
8. Write out of the text abstract all the abbreviations; give their non-contracted equivalents, compare the translations of the abbreviations to their non-contracted equivalents. Analyze the text abstract on the availability of non-contracted word combinations having generally-used abbreviations.
9. Write out of the text abstract all the international lexis; give their Ukrainian equivalents. Analyze the text abstract on the availability of Ukrainian words having generally-used international equivalents.
10. Write out of the text abstract all the “false friends of a translator”; give their proper meanings. Explain where it is possible the differences or peculiarities in the

meanings of the analyzed words. Explain the rules of choosing the proper lexical unit while translating.

11. Write out of the text abstract all the words used in their figural meaning; give their direct meaning. Explain the reasons of their using in a figural meaning.

12. Translate the following text abstract using available academic or electronic dictionaries (Multitran, Prompt etc.).

13. Make a plan of the text abstract.

14. Compile a vocabulary to the read and translated text abstract.

15. Compile a glossary of terms with their explanation in English to the analyzed text abstract.

TRAIN OPERATION

Accidents which took place on the railways in the early days made specialists devise a great number of systems and devices in order to ensure the safe operation of trains and to simplify the task of directing train movements. One of the ways to facilitate the problem of train operation is that all railroads, except the very short ones, are divided into sections or divisions operated just as a small railroad. The train with a long run is operated over many divisions and may change locomotives and crews several times in the course of its journey. A railroad runs two principal kinds of trains regular trains and extra trains. A regular train is a scheduled train, i. e. a train listed on the railroad timetable. Regular trains are all numbered. An extra train is not scheduled in the timetable, special trains, work trains and wreck trains are examples of extra trains. The list of times at which a regular train is to arrive at and leave a station is known as the train's schedule. The printed schedules of the regular trains form the timetable. The making of a timetable is the most complicated job in the operating business. In order to make up a timetable many factors have to be taken into account. The fact is that the railways make up different timetables for the summer and for the winter service and that the week-day timetable is not the same as that of Saturday and Sunday. Besides, one should not forget that the express trains and slow local trains have to run on the same tracks. And it is these tracks which are

also used by freight trains, whether they are slow or fast, diesel powered or electrically operated. Having taken into account these and many other factors, one may get an idea what difficulties are encountered when making a timetable.

Besides the making of timetables the operating business also includes the making of separate working programs for locomotives and train crews, the planning of regular switching operations and so on in other words, the operating business comprises all the problems connected with the safe and efficient operation of trains, whether passenger or freight. That the problems of railway operation must be now solved with the use of the most up-to-date technical aids is clear to everyone. Being introduced on railways, the technical aids greatly facilitate the task of directing train movements and make the job of the railwaymen simpler and more productive. The technical aids which provide the so-called telecommunication service comprise the telephone, the radio, and the television. Computerization of railway operations being widely introduced lately brings greater efficiency and reliability as well as considerable economic savings.

SAFETY PROBLEM

Safety depends on many factors. First of all, it is determined by the condition of the track. Track-testing cars driven slowly along the lines show the engineer where the track must be repaired and a great deal of track maintenance machines are available to keep the track well maintained. In discussing railway safety consideration should also be given to efficient braking systems. Another aspect of the railway safety problem is signalling. The need for signalling arose when the number of trains increased and it was necessary that the train movements should be directed by one way or another. One of methods of controlling the movements of trains is known as “Centralized Traffic Control” or CTC. The introduction of CTC is sure to be a step forward in the improvement of railway signalling.

Under CTC all train movements are governed from a central point where there is a large illuminated panel with a diagram of all the tracks in the controlled section. Below the diagram there are small buttons. Pushing the buttons the operator changes the position of switches and signals. A number of small lights on the diagram show

the dispatcher the location of each train. Having the location of all the trains in his section displayed for him the dispatcher can keep the train moving with as little delays as possible.

In spite of the reliable signalling system and highly efficient methods of train operation accidents still occur on railways, particularly on high-speed lines. Indeed, no engine driver would be able to read block signals easily at a speed of, say, 200 kph. Weather conditions can also prevent the driver from reading the wayside signals. Sometimes the drivers themselves are not careful enough. This has made railways change radically the entire system of signalling. The key to solve the problem of train operation has been found in the so-called semi-automatic driving of trains which is indispensable for safe operation of trains moving at top speed. By semi-automatic driving of trains is meant the use of locomotive cab signals and automatic train stop devices. The careful track maintenance, reliable signalling as well as efficient brakes are the factors which assure safe running of trains at high and super-high speeds thereby increasing the track carrying capacity and improving the utilization of the rolling stock.

COMMUNICATIONS

Railroads were among the first to adopt the electric telegraph and the telephone, both for dispatching trains and for handling other business messages. After World War II, when compact and reliable very-high-frequency two-way equipment was developed. In train operations radio permits communication between the front and the rear of a long train, between two trains, and between trains and the central dispatcher.

In terminals two-way radio greatly speeds yard-switching work. Through its use, widely separated elements of mechanized track maintenance gangs can maintain contact with each other and with oncoming trains. Supervisory personnel often use radio in automobiles to maintain contact with the operations under their control. One of the radio-devices being commonly used in the switching yard is the walkie-talkie. This individual radio helps the car inspector do a better job and saves him much time. As the demand for more railroad communication lines has grown, more and more

companies have begun to use broad-band radio beams (microwave) to supplement or replace the traditional line-side telegraph wires.

A major reason for the growing use of microwave was the tremendously increased demand for circuits developed from the railroads' widespread use of electronic computers. Earlier, railroads had been among the leaders in adopting pushed-card and other advanced techniques of data processing. In the 1970s there was a strong trend toward "total information" systems built around the computer. In such a system, each field reporting point, usually a freight-yard office or station is equipped with a computer input device. Through this device, full information about every car movement (or other action) taking place at that point can be placed directly into the central computer usually located at company headquarters. From data received from all field reporting points on the railroad, the computer can be programmed to produce a variety of outputs. These may include train-consist reports (listing cars) for the terminal next ahead of a train, car-location reports for the railroad's customer-service offices, car-movement information for the car-records department, revenue information for the accounting department, plus traffic-flow data and commodity statistics useful in market research and data on the freight car needs at each location to aid in distributing empty cars for loading. The train-to-wayside communication medium is currently undergoing a significant evolutionary change towards free air, lossy coax or radiax transmission technologies.

SIGNALLING

Because a railroad factory – its plant and train operations – may be spread out over thousands of miles and hundreds of communities, it is not surprising that railroads have been among the pioneers in the use of improved methods of communication and control. Railroad signals are form of communication designed to inform the train crew, particularly the engine crew, of track conditions ahead and to tell it how to operate the train. Methods of controlling train operations evolved over many years of trial and error. A common method in the early years was to run trains on a time-interval system; i.e. a train was required to leave station a certain number of minutes behind an earlier train moving in the same direction. It was common on

single-track lines to program all operations in accordance with a timetable, which set up all the places trains were to meet and which could not be varied.

The development of distance-interval system was a great improvement. In these so-called block systems, a train is prevented from entering a specific section of track until the train already in that section has left it. The earliest form of railroad signal was simply a flag by day or a lamp at night. The first movable signal was a revolving board introduced in the 1830s, followed m 1841 by the semaphore signal. One early signal consisted of a large ball that was hoisted to the top of a pole to inform the engineman that he might proceed (hence, the origin of the term highball). The semaphore signal was nearly universal until the early years of the 20th century, when it began to be superseded, first by the colour-light signal, and then by the searchlight type. The colour-light signal uses a separate lens and light bulb for each signal aspect, usually green, yellow, and red. The searchlight signal uses only a single, powerful lens and bulb, the different colours are displayed through the lens by means of roundels, or colour filters, that are rotated in front of the lamp. Two other types of signals are also used to a limited extent the position light in which rows of yellow lights duplicate the position of semaphore arms, and the colour-position light signal which uses coloured lights arranged in rows. Most lines in Europe use a manual block system in which operations are controlled from wayside cabins or towers in conjunction with the wayside signals. Each tower controls a section, a train is not permitted to enter a section until the train ahead has left the section. Electric interlocking improves this system making it impossible to give a “line clear” signal indication if the section is already occupied by attain.

BLOCK SYSTEM

The basis of much of today’s railroad signalling is the automatic block system introduced in 1872, one of the first examples of automation. It uses track circuits that are short-circuited by the wheels and axles of a train, putting the signals to the rear of the train and to the front as well as on single track at the danger aspect. A track circuit is made by the two rails of a section of track, insulated at their ends. Electric current fed into the section at one end flows through a relay at the opposite end. The wheels

of the train will then short-circuit the current supply and de-energize the relay. Signalling on African, Asian, and Australian systems usually follows European practice in areas of heavy traffic. On light traffic lines, control is often via the telegraph or telephone. Operation on the basis of a timetable alone, which was common on early lines in the United States, had the disadvantage that if one train were delayed, others would also be delayed, since it was impossible to change the meeting points. By using the telegraph, and later the telephone, the dispatcher could issue orders to keep trains moving in unusual circumstances or to operate extra trains as required. This "timetable-train order" system is still used on many lines in the United States and Canada. It is often supplemented with automatic block signals to provide an additional safety factor.

The first attempts at interlocking switches and signals were made in France in 1855 and in Britain in 1856. Interlocking at crossings and junctions prevents the signalman from displaying a clear signal for one route when he has already given clearance to a train on a conflicting route. Route-setting or route-interlocking systems are modern extensions of this principle. With them a tower-man or dispatcher can set up a complete route through a complicated track area by simply pushing buttons on a control panel. This system allows a large area to be controlled from one point. A logical development of the route-interlocking principle is centralized traffic control, a system in which trains are controlled entirely from a central point through remote operation of switches and signals. The operator sees the track layout in miniature on his control panel and directs the movement of trains. Lights on the panel show the location and progress of all trains at all times. In centralized traffic control, track circuiting is essential to ensure that the system always knows where each train is. Switches and signals are operated by coded electrical pulses that reduce the wiring required. Over long distances, centralized traffic control substantially increases track capacity by making more effective use of the trackage.

TREND TOWARD AUTOMATION

A recent refinement in traffic control is to arrange the system for fully automatic operation. The machine will then set switches and clear signals for each train

automatically, the dispatcher needs to exercise control only in unusual circumstances. This enables one dispatcher to control a still longer section of railroad. Completely automatic signalling activated by electronic program machines is used on some rapid-transit rail lines. Automatic train control provides the locomotive engineman with audible (and sometimes visual) information on track conditions. Should he ignore a restrictive signal indication, the brakes are applied automatically to stop the train. A refinement of this system incorporates automatic control of train speed. A miniature signal in the cab repeats the aspects of the wayside signals (or it may take the place of wayside signals). Should train speed exceed that called for by the aspect being displayed, the brakes are applied and the speed reduced to the permissible level.

Only a slight further extension of this technique is needed to permit fully automatic operation of the train. By the early 1970s, a number of mining and industrial railroads were operated with crewless trains under full automation or remote control. On the high-speed New Tokaido Line in Japan, all trains operate under computerized automatic control throughout the entire 320-mile (510-kilometre) length of the line. The engineman, however, starts the trains, stops the trains at the station stops, and opens and closes the train doors.

Among other automatic aids to railroad operation is the infrared “hotbox detector”, which, located at trackside, automatically detects the presence of an overheated wheel bearing and alerts the train crew. Broken flange detectors are used in major terminals to indicate the presence of damaged wheels. Dragging equipment detectors set wayside signals to danger if a car's brake rigging or other component is dragging on the track. Slide detectors warn of rocks or earth that have dropped onto the track from an earth cutting; high water detectors warn of flood conditions on the track; high-wide detectors alert the train crew of a freight load that may have shifted or of a load that is too high or wide to clear bridges or tunnels. A major area for automation techniques in railroading is the large classification or marshalling yard. In such yards, freight cars from many different origins are sorted out and placed in new trains going to the appropriate destinations completely automatically.

NEW TECHNOLOGIES ON WORLD RAILWAYS (1)

Nowadays one can hardly find fields in human activity where electronic machines or devices are not used. Traffic control, sorting yard operations, compiling schedules, designing locomotives and many other hard and time-consuming jobs are being increasingly performed by computers.

Perhaps, the most important trend in train control at present is the change of technology. Yesterday's technology was electro-mechanical; today electronic and computer technology dominates in rail traffic control and safety systems. Modern signalling is one important sphere of new technologies. Railroad signals (like the semaphore signal) are form of communication designed to inform the train crew of track conditions ahead and to instruct it how to operate the train. Traditional signals, which can be recorded, are speed, time, and distance. A number of digital signals such as door opening, brake application, switch positions, lamps, etc, as well as some analogue signals such as current and catenary voltage, are now added for recording. Recently the terms like radio-based signalling or telematics have been added to traditional signalling terminology. We are on the brink of a revolution which will transform signalling as we know it within the next decade.

The automation of railway services is leading to computer-integrated railroading, in which radio plays a very important role. On modern railways there is a clear trend towards the so-called railway operation control system (ROC) based on radio transmission. ROC includes traffic safety and train control, which supersedes traditional signalling. It helps to coordinate the operation of high-speed passenger services and slower freight trains on the same tracks, as well as the use of double-track lines in both directions. With the help of ROC, there will soon be virtual or electronic coupling of trains into a chain driving at a high speed. Together with "smart" trains and "intelligent" dispatching and control centres, ROC will form a triangle for improved profitability for the railways.

A great leap forward in radio-based communications systems is Transmission Based Signalling (TBS).

NEW TECHNOLOGIES ON WORLD RAILWAYS (2)

A great leap forward in radio-based communications systems is Transmission Based Signalling (TBS). TBS has a number of essential advantages over conventional signalling. First of all, it eliminates the need for tracks-circuits. Under TBS, trains establish their position through the use of the train equipment. Each train receives a movement authority based on the speed of the train that is constantly updated by radio. This information is presented to the driver on a cab display or passed to an Automatic Train Operation (ATO) controller. Safety is also increased due to the use Automatic Train Protection (ATP), which is a feature of TBS.

Britain is one of the first countries to adopt TBS. Jubilee Line of London Underground is currently the largest metro project underway in Europe. It needs the most technically advanced and innovative train control and signalling system, which is why the London Underground chose TBS. TBS is also being considered by railways throughout the world, from New York City Transit in the United States to metros in the Far East, and for many of the Trans European Network (TEN) routes throughout Europe. The second trend is increasing standardization. Within Europe, there exist 27 different signalling systems, five different types of electrification, different track and loading gauges, and different operating rules between national railways. It stands to reason, that signalling and train control systems have to be interoperable to ensure the safe and smooth flow of rail transport. With this aim, the European Rail Traffic Management System (ERTMS) has been designed. ERTM consists of European Train Control System (ETCS) and Global Systems for Mobile Communication for Railways (GSM-R). They are all aimed at “Europeanizing” national signalling systems and improving cross-border traffic so that the driver will always receive the same signalling information regardless of which country he is operating at the time. As all major signalling companies are involved in the development of ERTMS, it will soon be a radio-signalling standard for the world. German Rail (DB) became the first railway in Europe to implement GSM-R – the new standard for digital train radio on the Cologne – Frankfurt high-speed line in

2002. Thus, DB is pioneering the technological transition from older analogue networks to the new generation of digital systems.

NEW TECHNOLOGIES ON WORLD RAILWAYS (3)

Another highly-significant project for an interoperable railway system will be a standardized European Driver's Desk (EUDD) designed for interoperable rail services across borders. The EUDD will improve safety and working conditions by replacing hardware controls with flexible software display functions.

The electronic technique known as simulation creates virtual rail environment. Cab simulators have traditionally been applied only to driver training. The latest generation of multiple simulators can now be networked together to represent an "integrated railworld" which is much more complex than a single train in isolation. Such integrated simulators offer joint training for drivers, train controllers and operations control staff, all interacting in multidisciplinary teams. Using virtual reality theatres, a wider range of training scenarios can be provided. The trainees then can fully understand how their actions affect each other, which, in effect, helps to reduce human error in critical situations.

New developments in information technology and ever-expanding Internet have changed the world and the way of presenting passenger information. CyberRail is a new multi-media concept providing real-time information for passengers throughout their journey from door-to-door, taking into account every mode of transport. Passengers, railway operators and other railway companies can freely transmit, collect, and process the information. Passengers receive personalized travel plans, and railway operators can offer services according to demand. Electronic smart card ticketing and booking tickets on the Internet have become a regular thing for passengers. More and more countries are adopting smart cards with embedded chip instead of paper-based ticketing systems. Smart cards hold much more information than a magnetic stripe, and can be also used outside the mass transit systems for which they were designed, for instance, as "electronic purses". From contactless cards reloaded via the Internet to virtual tickets on mobile phones, today's technology has no limits. It is safe to say that investment in rail research is paid many times over.

New technologies will transform railways in the foreseeable future. In this information-intensive age, the modernization of signalling and telecommunications is even more important than the pursuit of higher train speeds. Future railway technologies have to be highly effective, interoperable, safe, environmentally friendly and allow for rapid innovation in the railway system.

RAILWAY TRAFFIC OPERATION (1)

Modern railway is a huge and complex system. Few passengers realize that it has required the services of a small army of trained railroad employees to make their travel possible. Railway traffic operation must ensure a safe and efficient handling of trains at all stages including stations, freight terminals, marshalling yards, signal and control centres, etc. In spite of all the differences between freight and passenger train operation, the fundamental principles are the same: to make up a train; to load it with passengers or freight; to handle it through the intermediate stations or terminals with least possible delay; to rearrange the trains and cars as needed; to change the engine and the crew on the longer runs, and to break up the trains at the final destination.

In order to facilitate the problem of train operation, all railroads, except the very short ones, are divided into sections or divisions operated just as a small railroad. A railroad runs two principal kinds of trains: regular trains and extra trains. A regular train is a scheduled train. Regular trains are all numbered: the trains in one direction have even numbers, while the trains in the opposite direction have odd numbers. An extra train is not scheduled in the timetable; special trains, work trains and wreck trains are examples of extra trains. The list of times at which a regular train is to arrive at and leave a station is known as the train's schedule. The printed schedules of the regular trains form the timetable. Compiling a timetable is, indeed, one of the most complicated jobs in the operation business. Dispatchers have to take into account a lot of things, namely, summer or winter service, weekday or weekend schedules, express or slow commuter trains, regular or extra service, freight or passenger trains, etc.

The operation business also includes management of marshalling (classification) yard work. In classification yards loaded freight cars from all the country are sorted

according to their final destination, and then joined to others to form a new train. Through the years this has been done manually. Modern yards use computers and Automatic Car Identification system (ACI) to speed the process of car classification. Electronic scanners read colour-coded identification labels on incoming cars and relay the information to yard computers that assign the cars to the proper track. Scanners do it three times faster than any car dispatcher.

RAILWAY TRAFFIC OPERATION (2)

An impressive example is Centralized Traffic Control (CTC), a system in which trains are controlled entirely from a central point through remote operation of switches and signals. The operator sees each train on a large control panel and directs traffic on hundreds of miles of railroad track. There is a separate lever for each switch and signal. When a train enters the controlled section, a small light flashes on the panel. It is the business of the operator to keep the trains moving with as little delay as possible. From the terminal the operator pushes a button or moves a lever, actuating switches and signals miles away. The switches and signals are all operated electrically and interlocked[3], so that it is impossible to admit two trains to the same track.

The most recent system of automatic traffic operation has been developed in Japan. Autonomous Transport Operation Control System (ATOS) is designed specifically for lines with high-density traffic and utilizes the latest computer technology. A key concept in the development of ATOS is that the operational control should be transferred from the station to the train control dispatcher in the control centre. ATOS is totally different from CTC as it dispenses with the large wall-mounted train location panel. ATOS displays a graphic real-time diagram of the operating status of a train on a computer screen. The schedule diagram can be changed with a click of a mouse, which automatically adjusts the operations of all trains. Under fully automatic operation the dispatcher needs exercise manual control only in unusual situation, all train movements being set by electronic machines.

Telecommunications devices such as the telephone, radio and television are widely used in traffic operation. Thanks to the radio, the danger of train collisions has

been greatly decreased. The locomotive drivers can communicate with wayside stations along the track or with other trains on the route. In case of an emergency the engine driver can radio a warning to other drivers or ask the dispatcher for help. The radio and TV have also proved very useful in the marshalling yards during the sorting and inspection of train consists. The age of computers and cyber information systems brings about a renewal of railway and its traditional forms of management. High technologies greatly contribute to the safety and efficiency, which are the priorities in traffic operation.

INCREASING EFFICIENCY AND IMPROVING SAFETY

Railways are achieving increasingly higher levels of automation. There are many features which affect rail safety and operating efficiency through the instrumentality of better automation and improved signalling. Of particular significance is the role of the computer in traffic management and signalling. Why are railways undergoing a worldwide renaissance? In the West, increasing concern for the environment, escalating energy costs and meeting future demands for the extra capacity that road transport cannot meet are three factors acting in favour of rail transport. These are the principal reasons for the re-emergence of the tram in Western Europe and parts of North America after years of decline. In other parts of the world, the impetus comes from the necessity for improving a nation's transport infrastructure, and the most effective way of achieving this is to improve existing permanent way or build new lines and networks. Nowhere is this more apparent than in China.

There are two common factors influencing railway expansion irrespective of geography or location – operational safety and economic operation. Here the determinants are more than just better locomotion, improved rolling stock and reduced energy consumption. Better control over all aspects of operations and improved coordination of the permanent way infrastructure through, for example, better signalling, are equally relevant to the modern railway. Effective and efficient management will become just as important for future rail traffic operation as it is for today's air traffic control.

The economics of railway operations is largely dependent on the availability of the network, to what extent it is utilised and, of course, the overall operating efficiency of the transport utility running the network. More effective rail traffic management can greatly influence these considerations. Designing and configuring a rail traffic management system presents three key questions: What are the economic expectations of installing such a system? What are the essential system requirements of the operating utility? What are the operational, organizational and regulatory requirements affecting the system? In most instances a centralized control system is likely to provide the most immediate beneficial results, but operating circumstances and existing infrastructures need to be borne in mind. Automation is not a panacea for rail transportation problems, but it is a means of effecting safer and more efficient operation.

TRANSMISSION-BASED TECHNOLOGY

As population densities soar, traffic congestion becomes the form, the time required for commuting gets longer even day and urban pollution increases; all factors leading to increased stress and difficulties for today's city dweller. The optimal solution to this never ending spiral is to provide more efficient means of mass transportation. Urban planners originally relied-on the building of more roads to overcome transportation problems, but as road use soared, planners commenced mass transit projects to ease the strain on roadways. Not too many years later, we now find major subways and LRT operations overcrowded. The answer to these problems is to make better use of the investment that has been made or is about to be made in rolling stock and in station and signalling infrastructures.

The number of passengers that can be moved through a subway varies in direct relationship to the number of trains that can safely be operated on a system and the spacing between each train. Conventionally equipped subways use a fixed block principle for safe train separation; the tracks are divided into a number of sections or blocks of predetermined lengths. The length of these blocks is based on the worst case stopping characteristics of the longest train travelling at its fastest velocity. This results in long block lengths and with only one train permitted to be in a block at one

time, and in fact there is normally an empty block between the two blocks occupied by consecutive trains. This situation eventually leads to a limitation on passenger throughput as more trains are added to the system.

With the advent of modern computer and digital data transmission capabilities, new techniques for safely managing trains in subways have been developed. Utilization of moving block tram control does away with these large fixed blocks and as a result creates the opportunity to significantly reduce the interval between trains. The resultant increased service frequency allows more people to move through the system in a given period of time, reducing platform crowding and providing better utilization of the subway's infrastructure. All of this is possible without any impact on safety.

INCREASING SYSTEM CAPACITY WITH NEW TECHNOLOGY

The moving block principle is based on the stopping distance that is required for each individual train at its current prevailing speed. High speed computers, located onboard and at wayside, perform extensive real tune calculations that take into consideration the train's current position, stopping characteristics, guide way slope, brake activation delays and the location of current obstacles further down the guide way. From this information, the minimum safe distance of train separation is determined. This determination is performed on a very short cycle, normally once every second. This rapid, cyclical determination of the minimum safe distance of separation creates the opportunity for the system to make maximum use of the track resource. More trains can be used on the subway and the distances between trains can be minimized, headways become much shorter than are practically possible in fixed block systems. The design headway of the system is limited only by the design of the guide-way and the performance characteristics of the train.

Utilization of a computerized moving block concept for controlling trains in a subway not only increases the through-put of a system, it also accommodates changes in vehicle capabilities or the introduction of new vehicles by modification of software parameters and guide way tables. Information regarding the health or the train can be transferred from the train to the operators at central control and information from

central control can be sent for operator and passenger display purposes on the vehicle. Tram stopping at stations becomes much more accurate as the stopping point becomes a fixed position under computer control, not based on the driver's ability to "stop on a dime" at each station.

Main of the major suppliers in the signalling industry are in the process of designing moving block systems and some are currently being installed: London, Hong Kong and Kuala Lumpur are examples. Several systems are actually in service, such as the Docklands Light Railway, Vancouver's Sky Train, the Scarborough RTM Toronto, the Detroit Downtown People Mover, all of which are communications-based moving block signalling systems.

MODERN TECHNOLOGY

There are many train automation systems in operation around the world which perform such duties as remote interlocking, centralized control of traffic movement, and automatic routing within a given interlocking section and often beyond. These, and many other tasks, can be considered to fall within the scope of operational control, and allow for a high degree of automated traffic flow. Modem computer-based control technology can greatly enhance these procedures by automating the decision-supporting process and so assist operations staff in their day-to-day duties. Typically, these could include automatic train routing, initiation of information systems (for the travelling public as well as staff) and coordinating connections with other rail traffic systems, such as suburban and regional services. Added to this are further functions such as rolling stock dispatch. Deployment of staff (both operational and maintenance), interactive changes to timetables and the automatic prevention of potential traffic conflicts. These varied functions are concerned directly with general and miscellaneous traffic management. Freight management too can benefit from automation. Typically, this would include the location and cargos of specific freight trams, the administration, of freight data, the tracking of allocated rolling stock, freight terminal and relevant track administration, optimizing tram formations, and evaluating all electronically stored data and presenting it in an easy-to-use format.

But automation does not end here. High-level planning can also benefit – simulation techniques and the presentation of complex statistical material come to mind.

Communications-based train control is emerging as the preferred solution to the challenges facing today's transit operator. Communications-based Train Control is characterized by the use of a bidirectional, train-to-wayside communications link for train location determination, independent of track circuits. The primary advantages of this technology are: high accuracy and resolution of train position; continuous communication and hence continuous control/supervision; increased operating flexibility, lower life-cycle costs due to reduced wayside hardware; communications link allows increased information flow; conducive to an overlay strategy on an existing operation.

SELF-TRAINING ASSIGNMENTS

I. Matching the translation properly

1. Згідно з проектом потяг повинен був рухатися на шістьох пластинах.

A. According to the project the train was to move on six plates.
B. According to those projects the train was to move on six plates.
C. According to the project the trains were to move on six plates.
D. According to the project the train was to move on sixteen plates.

2. У результаті, талановитого винахідника було вбито, а його залізницю зруйновано.
A. As a result, the talented inventor was killed and his railway ruined.
B. The talented inventor was killed and his railway ruined.
C. As a result, the inventor was killed and his railway ruined.
D. As a result, all the talented inventors were killed and their railways ruined.

3. Інженерам сказали, що залізницю необхідно перевести на електричну тягу.

A. The engineer was told the railway was to be transferred to electric traction.
B. The engineers told the railway was to be transferred to electric traction.
C. The engineers were told the railway was to be transferred to electric traction.
D. The engineers were told the railway would to be transferred to electric traction.

4. Робітники повідомили, що джерело енергії уже встановлено на транспортному засобі.
A. The worker informed the power source had already been installed in the vehicle.
B. The workers were informed the power source had been installed in the vehicle.
C. The workers are informed the power source had already been installed in the vehicle.
D. The workers informed the power source had already been installed in the vehicle.

5. Слід зазначити, що транспортні засоби, що рухаються у «трубі», матимуть малі втрати енергії.
A. One should have mentioned that the vehicles running in a tube will have small power losses.
B. One should mention that the vehicles running in a tube will have small power losses.
C. One should mention that the vehicles running in a tube have small power losses.
D. One should mention that the vehicles running in a tube will have power losses.

6. Уся історія залізниці була спрямована на розвиток дешевших та ефективніших засобів транспорту.
A. The railway history was aimed at developing cheaper and more efficient means of transportation.
B. The whole history was aimed at developing cheaper and more efficient means of transportation.
C. The whole railway history was aimed at developing cheap and efficient means of transportation.
D. The whole railway history was aimed at developing cheaper and more efficient means of transportation.

7. Коли поїзд рухався, вода повинна була рівномірно розташовуватися між пластинами та колією.
A. While the train was running the water was to be spread evenly between the plates and the track.
B. While running the water was spread evenly between the plates and the track.
C. While the water is to be spread evenly between the plates and the track.
D. While the train was running the water was to be spread between the plates and the track.

8. Після будівництва експериментальна лінія мала успіх.

A. When constructed, the experimental lines were a success.
B. Before constructed, the experimental line was a success.
C. When constructed, the experiments on the line were successful.
D. When constructed, the experimental line was a success.

9. Люди були здивовані її плавністю, безшумністю роботи та досягнутою швидкістю.
A. Nobody was surprised by its smoothness, the noiseless operation and the speed attained.
B. People were surprised by its smoothness, the noiseless operation and the speed attained.
C. People were surprised by its smoothness, the noisy operation and the speed attained.
D. People are surprised by its smoothness, the noiseless operation and the speed attained.

10. Ця залізниця виявилася набагато дешевшою у порівнянні з традиційними залізницями.
A. These railways proved much cheaper in comparison with conventional railways.
B. This railway proved much cheaper in comparison with conventional railways.
C. This railway proved cheaper in comparison with conventional railways.
D. This railway proved much cheaper in comparison with unconventional railways.

Key: 1 a, 2 a, 3 c, 4 d, 5 b, 6 d, 7 a, 8 d, 9 b, 10 b

II. Matching the translation properly

1. Унаслідок розвитку промисловості залізниці повинні здійснювати більший обсяг перевезень.

A. With the development they have to carry a greater volume of freight traffic.
B. With the development of railways they have to carry a great volume of traffic.
C. With the rapid development of industry it will have to carry traffic.
D. With the development of industry railways have to carry a greater volume of traffic.

2. Усі залізниці України мають однакову ширину колії.

A. All the Ukrainian Railways have the same gauge.
B. All the Ukrainian Railways had the same gauge.
C. All the Ukrainian Railways have had the same gauge.
D. All the Ukrainian Railways will have the gauge.

3. Учені працюють над розробкою нових комп'ютерів, які є швидшими та ефективнішими за ті, що ми використовуємо сьогодні.

A. Scientists develop computers faster and more efficient than those we use today.
B. Scientists work to develop new computers faster and more efficient than those we use today.
C. Scientists work to develop faster and more efficient computers than those we use today.
D. Scientists work to develop new computers faster and more efficient than those they use.

4. Чи кладуть шпали на землю?

A. Are the ties laid under the earth?
B. Are the ties laid above the earth?
C. Are the ties laid upon the earth?
D. Are the ties laid near the earth?

5. Механізм, що використовують для переведення потягів з колії на іншу, називають стрілкою.

A. This mechanism moves trains from one track to another and is called a switch.
B. The mechanisms which are used to move trains from track are called switches.
C. The mechanism which moves trains from one track to another is called a switch.
D. The mechanism which is used to move trains from track to another is called a switch.

6. Учені працюють, щоб вдосконалити машини, які ми використовуємо сьогодні.

A. Scientists worked hard to improve the machines which we use today.
B. Scientists work to improve the machines used today.
C. Scientists work to improve the machines which we use today.
D. Scientists work hard to improve the machines which are used today.

7. Я знав, що рейки виготовляють з криці.

A. I knew that the rails were made of steel.
B. I knew that the rails were made of crushed stone.

C. I know that the rails were made of steel.
D. I know that the rails are made of steel.

8. Відстань між рейками відома як ширина залізничної колії.

A. The distances between the rails are known as the railway gauges.
B. The distinction between the rails is known as the railway gauge.
C. The distance between the rails is known as the railway gauge.
D. The distance between the rails is being known as the railway gauge.

9. Шпали кладуть на баласт, що є основою залізничної колії.

A. The ties are laid on ballast which is the foundation of the railway track.
B. The ties are laid on ballast which is the element of the railway track.
C. The ties are laid on ballast which is the part of the railway track.
D. The ties are laid on ballast which is the first foundation of the railway track.

10. Проведене дослідження показало підвищення цін на нафту.

A. The investigation showed an increase in oil prices.
B. The investigation of oil prices was carried out.
C. The investigation carried out showed an increase in oil supplies.
D. The investigation carried out showed an increase in oil prices.

Key: 1 d, 2 a, 3 b, 4 c, 5 d, 6 c, 7 a, 8 c, 9 a, 10 d

III. Matching the translation properly

1. Після того, як смуга відведення вичищена та вирівняна, будується верхня будова колії.
A. Before the right-of-way is cleared the permanent way is constructed.
B. After the right-of-way was cleared the permanent way was constructed.
C. After the right-of-way is cleared and graded the permanent way is constructed.
D. After the right-of-way is graded the permanent way is constructed.

2. Перші колії не мали баласту.

A. The first tracks had no ballast.
B. The first tracks had one ballast.
C. The first tracks had some ballast.
D. The first tracks had ballast.

3. Перші рейки були з деревини та спиралися на важкі гранітні брили.

A. The first rails were made of wood and rested on heavy blocks of granite.
B. The first rails were made of wood and rested on granite.
C. The first rails were made of wood and rested on heavy blocks of concrete.
D. The first rails were made of wood and rested on heavy blocks of stone.

4. Шпали та рейки кладуть на баластну основу.

A. Ties and rails are laid under the ballast foundation.

B. Ties or rails are laid upon the ballast foundation.
C. Ties and rails are laid upon the ballast foundation.
D. Neither ties nor rails are laid upon the ballast foundation.

5. Відкриття, того як виготовляти дешеву крицю, мало велике значення для залізниці.

A. The discovery how to make steel was of great importance to the railways.
B. The discovery how to make cheap steel was of great importance to the railways.
C. The discovery how to make cheap steel is of great importance to the railways.
D. The discovery how to make steel will be of great importance to the railways.

6. В Америці ширину колії було уніфіковано лише у 1886 році.

A. In America the gauge was unified only in 1686.
B. In America the gauge was unified only in 1866.
C. In America the gauge was unified only in 1886.
D. In America the gauge wasn't unified until 1886.

7. Проте, такий тип колії був недостатньо міцним для важких паротягів.

A. These kinds of track, however, were not strong enough for heavy steam trains.
B. That kind of track, however, was not strong enough for heavy steam trains.
C. This kind of track, however, was strong enough for heavy steam trains.
D. This kind of track, however, was not strong enough for heavy steam trains.

8. Найбільші та найважчі рейки укладають на магістральних коліях.

A. Large and heavy rails are laid in the main-line tracks.
B. Larger and heavier rails are laid in the main-line tracks.
C. The largest and the heaviest rails are laid in the main-line tracks.
D. The larger the rails, the heavier the main-line tracks are.

9. Баласт насипають між шпалами та з кожного боку колії.

A. The ballast is packed above the ties and on each side of the track.
B. The ballast is packed between the ties and on the track.
C. The ballast is packed under the ties and on each side of the track.
D. The ballast is packed between the ties and on each side of the track.

10. Щоб примусити шпали служити довше, їх обробляли креозотом.

A. In order to make ties last longer they were treated with creosote.
B. In order to make ties last long they were treated with creosote.
C. In order to make ties last long they are treated with creosote.
D. In order to make ties last longer they were treated with concrete.

Key: 1 c, 2 a, 3 a, 4 c, 5 b, 6 c, 7 d, 8 c, 9 d, 10 a

IV. Matching the translation properly

1. Залізниці повинні впроваджувати нові типи вантажних вагонів для

транспортування специфічних вантажів.

A. Railways had to introduce new types of freight cars to transport special kinds of freight.
B. Railways have introduced new types of freight cars to transport special kinds of freight.
C. Railways have to introduce new types of freight cars to transport special kinds of freight.
D. Railways have and introduce new types of cars to transport special kinds of freight.

2. Сталеві рейки було використано у США вперше в 1863.

A. Steel rails were used in the USA for the first time in 1863.
B. Steel rails were used for the first time in 1863.
C. Steel rails were used in the USSR for the first time in 1863.
D. Steel rails were used in the USA in 1863.

3. Баласт – це елемент колії, який підтримує шпали та рейки та утримує їх в належному положенні.

A. Ballast is a track which supports rails and ties and holds them in the needed position.
B. Ballast is an element which supports rails and ties and holds them in the needed position.
C. Ballast is an element of the track which supports rails and ties in the needed position.
D. Ballast is an element of the track which supports rails and ties and holds them in the needed position.

4. Рейки без стиків відомі як «безперервні» або «подовжені» рейки.

A. The rails joints are known as continuous rails.
B. The rails without joints are known as continuous joints.
C. The rails without joints are known as continuous rails joints.
D. The rails without joints are known as continuous rails.

5. Винахід парового двигуна зробив залізницю найважливішим засобом перевезень.

A. The invention of the engine made the railway an important means of transportation.
B. The invention of the steam made the railway important means of transportation.
C. The invention of the steam engine made the railway the most important means of transportation.
D. The invention of the steam engine makes the railway the most important means of transportation.

6. Які етапи розвитку залізничної колії ви знаєте?

A. What steps in the development of railroad track do you know?
B. What kind of the development of railroad track do you know?
C. What steps in the development of railroad track did you know?
D. What steps in the development of railroad track will you know?

7. Кабіна водія трамвайного вагону має контрольну панель з усім необхідним обладнанням.

A. The driver of the tramcar has a control panel with all the necessary equipment.
B. The driver’s cab of the tramcar has a control panel with all the necessary equipment.
C. The drivers’ cabs of the tramcar have control panels with all the necessary equipment.
D. The driver’s cab of the train has a control panel with all the necessary equipment.

8. Перші сталеві рейки прибули в США з Англії.

A. The first steel rails came from the USA to England.
B. The last steel rails came to the USA from England.
C. The first steel rails came to the USA from England.
D. At last steel rails came to the USA and to England.

9. Сьогодні одна з важливих проблем залізниць – збільшення швидкостей.

A. Today, one of the most important problems for railways is to increase speeds.
B. Today, one of the important problems for railways is to increase speeds.
C. Today, the most important problems for railways are to increase speeds.
D. One of the most important problems for railways is to increase speeds today.

10. Обидва потяги йшли з однаковою швидкістю.

A. Both trains ran at the same speed.
B. Both trains run at the same speed.
C. Both trains will run at the same speed.
D. Both trains are run at the same speed.

Key: 1 c, 2 a, 3 d, 4 d, 5 c, 6 a, 7 b, 8 c, 9 a, 10 a

V. Matching the translation properly

1. Комп'ютери з'явилися на залізницях багатьох країн.

A. Electronic computers have already appeared on railroads of main countries.
B. Electronics and computers have already appeared on railroads of many countries.
C. Electronic computers will have already appeared on railroads of many countries.
D. Electronic computers have already appeared on railroads of many countries.

2. Згідно з проектом, залізницю побудують наступного року.

A. According to the project the railway is to be built next year.
B. According to the project the railway won't be built next year.
C. According to the project the railway was built last year.
D. According to the project the railway will be built in a year.

3. Залізниця впровадила новий вид вантажного вагону для цементу.

A. Railway introduced a new type of freight car for transporting cement.
B. Railway has introduced a new type of freight car for cement.
C. Railway has been introducing a new type of freight car for cement.
D. Railway introduces a new type of freight car for transporting cement.

4. Часто залізниці доводиться будувати в важких умовах.

A. Very often railways are built in hard conditions.
B. Very often railways have to be built in hard conditions.
C. Very seldom railways have to be built in hard conditions.
D. Many railways have been built in hard conditions.

5. Метро побудовано в багатьох містах нашої країни.

A. Underground railways have been built in many cities of our country.
B. Underground railways have been built in all main cities of our country.
C. Underground railways have been built in many cities of the world.
D. Underground railways have never been built in many cities of our country.

6. Залізниця вплинула на розвиток кожної країни.

A. The railroad is influenced by the development of each country.
B. The railroad has influenced the development of other country.
C. The railroad has never influenced the development of each country.
D. The railroad has influenced the development of each country.

7. Залізниці використовують для перевезення вантажів і для подорожей.

A. Railroads are used for transportation of freight and for travelling.
B. Railroads are using for transportation of freight and for travelling.
C. Railroads used for transportation of freight and for travelling.
D. Railroads were used for transportation of freight and for travelling.

8. Шпали для швидкісних залізниць мають бути виготовлені з бетону.

A. The sleepers for high-speed railways have been made of concrete.
B. The sleepers for high-speed railways have to be made of concrete.
C. The sleepers for high-speed railways are made of concrete.
D. The sleepers for high-speed railways were made of concrete.

9. Місце на колії, де зустрічаються кінці рейок, називають стик.

A. The place where the ends of the rails meet in the track is a joint.
B. The place where the ends of the rails meet in the track is called a joint.
C. The place where the ends of the rails meet in the railroad track is called a joint.
D. The place where the rails meet in the track is called a railway joint.

10. Саме баласт підтримує залізничну колію.

A. The ballast supports the track structure.
B. The ballast is supporting the track structure.
C. It was the ballast that supported the track structure.
D. It is the ballast that supports the track structure.

Key: 1 a, 2 a, 3 b, 4 b, 5 a, 6 d, 7 a, 8 b, 9 b, 10 d

VI. Matching the translation properly

1. Ця ідея висміювалася багатьма, але дехто повірив, що вона перспективна.

A. This idea laughed at by many, but some people believed that it was promising.
B. This idea was laughing at by many, but some people believed that it was promising.
C. This idea was laughed at by many, but same people believed that it was promising.

D. This idea was laughed at by many, but some people believed that it was promising.

2. Деякі фахівці не думають, що монорейка стане частиною нашого життя в майбутньому.

A. Same specialists do not think that monorails will become part of our life in the future.
B. Some specialists do not think that monorails will become part of our life in the future.
C. Some specialists did not think that monorails became part of our life in the future.
D. Some specialists not think that monorails will become part of our life in the future.

3. Обидва методи можна використовувати.

A. Two methods may be used.
B. Each method may be used.
C. Both methods may be used.
D. Every method may be used.

4. Кожний метод дозволяє заощадити кошти при технічному обслуговуванні.

A. Each method allowed savings in maintenance costs.
B. Each method allows saving in maintenance cost.
C. Each methods allow economy in maintenance costs.
D. Each method allows savings in maintenance costs.

5. У 1882р. з'явився один із перших проектів монорейкової залізниці.

A. One of the first monorail's projects appeared in 1882.
B. Once of the first monorail's projects appeared in 1882.
C. One of the first monorail project appeared in 1882.
D. One of the first monorail's projects appears in 1882.

6. Комп'ютер – це найвидатніше досягнення XX ст.

A. The electric computer is the most remarkable achievement of the 20-th century.
B. The electronic computer is the most remarkable achievement of the 20-th century.
C. The electric computer was the most remarkable achievement of the 20-th century.
D. The electronic computer is the most remarkable achievement of the 20 centuries.

7. Хто проектував монорейку, як військовий транспорт ?

A. Who was designing monorail as military purposes?
B. Who was designed by monorail for military purposes?
C. Who was designing monorail for military purposes?
D. Who were designing monorail for military actions?

8. Він може виконати цю роботу швидко та ефективно.

A. It can do this work quickly and efficiently.
B. He can do this quickly and efficiently.
C. It could do this work quickly and efficiently.
D. It can do that work quickly and efficiently.

9. В 19 ст. з'явилися перші «підземки».

A. In the 19-th century the first „undergrounds” are appearing.
B. In the 19 centuries the first „undergrounds” appeared.
C. In the 19-th century the first „undergrounds” appeared.
D. In the 19-th century the „undergrounds” appeared.

10. У 1938р. 126 миль/год був світовий рекорд швидкості для паровоза.

A. In 1968 the world speed record for a steam locomotive was 126 kph.
B. In 1938 the worlds speeds record for a steam locomotive was 126 kph.
C. In 1938 the world speed record for a steam locomotive was 126 mph.
D. In 1938 the world speed record for a steam locomotive was 126 kph.

Key: 1 d, 2 b, 3 c, 4 b, 5 a, 6 b, 7 c, 8 a, 9 c, 10 c

VII. Matching the translation properly

1. Можна очікувати, що середня швидкість поїздів збільшиться.

A. Once can expect that the average speed of trains will be increased.
B. One can expect that the average speed of trains will be increased.
C. Can expect that the average speed of trains will be increased.
D. One can expect that the middle speed of trains will be increased.

2. Нещодавно оригінальний пасажирський вагон було розроблено в Луганську.

A. Recently a passenger car of original design had been developed in Luhansk.
B. Recently passenger cars of original design have been developed in Luhansk.
C. Recently a passenger car of original designing has been developed in Luhansk.
D. Recently a passenger car of original design has been developed in Luhansk.

3. Інша справжня монорейкова система була запропонована Шиловським.

A. Other true monorail system was proposed by Peter Shilovsky.
B. Another true monorail system was proposed to Peter Shilovsky.
C. Another true monorail system was proposed by Peter Shilovsky.
D. Another true monorail system was proposed after Peter Shilovsky.

4. Сьогодні існує ряд монорейкових систем, які експлуатуються у світі.

A. There exists a number of monorails operating in the world today.
B. There existed a number of monorails operating in the world today.
C. There exist a number of monorails operating in the world today.
D. There exist numbers of monorails operating in the world today.

5. Більшість монорейкових систем, що існують у світі, – експериментальні.

A. Most of the monorail systems existing in the world are experimental.
B. Much of the monorail systems existing in the world are experimental.
C. Most of the monorail systems existed in the world are experimental.
D. Most of the monorail systems existing in the world are experimenting.

6. Крім безпеки, він надає більшу усталеність колії.

A. In additional to safety it permits greater track stability.
B. In additions to safety it permits greater track stability.
C. In addition to safety it permits the greatest track stability.
D. In addition to safety it permits greater track stability.

7. Існують монорейки, що обслуговують парки та аеропорти великих міст.

A. There exist monorails serviced by parks and airports of big cities.
B. There exist monorail service parks and airports of big cities.
C. There exist monorails servicing parks and airports of big cities.
D. There exist monorails servicing parks and airports in cities.

8. Ця машина може виконувати математичні обчислення, зберігати та аналізувати інформацію, введену в неї.

A. This machine can make mathematics calculations, store, select information put into.
B. This machine can make mathematical calculations, store and select information put into it.
C. These machine can make mathematical calculations, store and select information put into.
D. This machine can made mathematical calculations, store and select information put into it.

9. Щоб гарантувати безпеку, робітники регулярно перевіряють поїзди.

A. To provide safety of the workers examine the trains regularly.
B. To provide safety of the works examine the trains regularly.
C. To provide it safe the workers examine the trains regularly.
D. To provide safety the workers examine the trains regularly.

10. Використання комп'ютерів полегшило працю людини.

A. The use of computers has been facilitated by man's labour.
B. The use of computers has been facilitated by means of labour.
C. The useful computers have facilitated man's labour.
D. The use of computers has facilitated man's labour.

Key: 1 b, 2 d, 3 c, 4 c, 5 a, 6 d, 7 c, 8 b, 9 d, 10 d

VIII. Matching the translation properly

1. Монорейка може бути побудована високо над вулицею.

A. Monorails can be built above the streets.
B. Monorails one can build high above the streets.
C. Monorail can be built high above the street.
D. Monorails can be built high above the streets.

2. Без допомоги такий вагон не може утримувати рівновагу.

A. Without help, such car cannot keep its balance.
B. With help, such car can keep its balance.
C. Without help, such cars cannot keep their balance.
D. Without help, some cars cannot keep its balance.

3. Коли власник автомобіля подорожує, він ураховує лише вартість бензину.

A. While the car owner wants to travel he considers only the cost of the petrol.
B. When the car owners want to travel they consider only the cost of the petrol.
C. When the car owner wants to travel he counted only the cost of the petrol.
D. When the car owner travels he considers only the cost of the petrol.

4. Але перші комп'ютери були завеликими та занадто повільними.

A. But the first computers were big and slow.
B. But the first computers were very big and too slow.
C. But their first computers were too big and too slow.
D. But the first computers were too big and too slow.

5. Вони не мали успіху.

A. They were not success.
B. They had not a success.
C. They didn't have a success.
D. They were not a success.

6. Цей тип системи кондиціювання повітря забезпечує зручнішу подорож у будь-яку погоду.

A. This type of air-conditioning ensures more comfortable travelling in any weather.
B. This type of air-conditioning system ensures more comfortable travelling in any weather.
C. These types of air-conditioning system ensure comfortable travels in any weather.
D. This type of air-conditioning system ensured comfortable travelling in all weather.

7. Без перевезень не могло б бути цивілізації.

A. With transportation there could be civilization.
B. Without transportation there could be no civilization.
C. Without transportation there could be no civilization.
D. Without transport there can be no civilization.

8. На виставці можна було побачити останні колієукладальні машини.

A. At the exhibition you could see the latest track-laying machines.
B. At the exhibition one could see the last track-laying machines.
C. At the exhibition one could see the latest track-laying machines.
D. At the exhibition one saw the latest track-laying machines.

9. Іноді лінії метро необхідно прокладати якомога ближче до поверхні землі.

A. Some underground lines have to be laid as close to the surface as possible.
B. Sometimes the underground lines have to be laid as close to the surface as possible.
C. Sometimes the underground lines had to be laid as close to the surface as possible.
D. Sometimes the underground lines were laid as close to the surface as possible.

10. Система, яка відкриває більші можливості для розвитку технологій, називається перспективною.

A. A system which opens greater possibilities for the development of technology is a promising one.
B. Any possibilities for the development of technology is a promising system.
C. A system which opens great potential for the development of technology is promising.
D. A system which opens great possibilities for the development of technology is a promising one.

Key: 1 c, 2 a, 3 d, 4 d, 5 d, 6 b, 7 c, 8 c, 9 b, 10 a

IX. Matching the translation properly

1. Водій поїзда спілкується з пасажирами через систему оповіщення пасажирів.

A. The train master communicates with the passengers over a public address system.
B. The trainer communicates with the passengers over a public address system.
C. The train master communicated with the passengers over a public address system.
D. The trainer communicates with the passengers over a public addressing system.

2. Шпали, зроблені з бетону, слугують дуже довго.

A. The ties are made of concrete, they last very long.
B. The ties making concrete last very long.
C. The ties made of concrete last very long.
D. The tights made of concrete last very long.

3. Існує багато проектів зв'язати Нью-Йорк і Вашингтон швидкісною транспортною системою.

A. There are exist many projects to link New York and Washington by a rapid transport system.
B. Exist many projects to link New York and Washington by a rapid transportation system.
C. There exist many projects to link New York and Washington by a rapid transportation system.
D. There exist main project to link New York and Washington by a rapid transportation system.

4. Існують монорейкові дороги підвісного та навісного типу.

A. There are monorails of a suspended type and of a supported type.
B. They are monorails of a suspended type and of a supported type.
C. They're monorails of a suspended type and of a supported type.
D. There were monorails of a suspended type and of a supported type.

5. У чому полягають переваги використання монорейок?

A. What are the advantages of monorails?
B. What are the advantages of using monorails?
C. What are the lacks of using monorails?
D. What are the drawbacks of using monorails?

6. Швидкість 140 км/год може бути досягнута сучасними локомотивами.

A. A speed of 140 kph can be reached by modern locomotives.
B. A speed of 140 kph can be reaching by modern locomotives.
C. A speed of 140 kph has been reached by modern locomotives.
D. A speed of 140 kph can have been reached by modern locomotives.

7. Існує уже багато вдосконалень у методах будівництва метрополітену.

A. There have been many improvements in the methods of building underground railways.
B. There have been many improvements in the method of building underground railways.
C. There have many improvements in the methods of building underground railways.
D. They have many improvements in the methods of building underground railways.

8. Якщо монорейки будувати над землею, вони займатимуть дуже мало місця.

A. If monorails are built under the ground, they will occupy very little space.
B. If monorails are built above the ground, they will occupy very little space.
C. If monorails are built above the ground, they occupy very little space.
D. If monorails are built above the ground, they will occupy some space.

9. Вагони, що використовуються для вантажних перевезень, – міцно збудовані.

A. The cars used for transporting freight are strong built.
B. The cars used for freight transport are strong.
C. The cars used for transporting freight are strongly built.
D. The cars using for transporting freight are strongly built.

10. І автомобіль, і локомотив, і мотоцикл можна назвати транспортними засобами.

A. And a car, and a locomotive, and a motorcycle may be called a vehicle.
B. Either a car, a locomotive, or a motorcycle may be called a vehicle.
C. Either a car, a locomotive, or a motorcycle may call a vehicle.
D. Either a car, a locomotive, or a motorcycle may have been called a vehicle.

Key: 1 a, 2 c, 3 c, 4 a, 5 b, 6 a, 7 a, 8 b, 9 c, 10 b

X. Matching the translation properly

1. Економічний розвиток кожної країни тісно пов’язаний з її транспортною мережею.

A. The economic development of any country is closely connected with its transport network.
B. The economic development of each country is closely connected with its transport network.
C. The economic development of a country is connected with its transport network.
D. The economic development of each country is closely connected with its political system.

2. Кожного дня приблизно 600 пасажирських поїздів міжміського і міжнародного сполучення курсують українськими залізницями.

A. Every day more than 600 passenger trains of intercity and international communication circulate over Ukrainian Railways.
B. Every day about 600 passenger trains of international communication circulate over Ukrainian Railways.
C. Every year about 600 passenger trains of intercity and international communication circulate over Ukrainian Railways.
D. Every day about 600 passenger trains of intercity and international communication circulate over Ukrainian Railways.

3. Технологічна швидкість на окремих ділянках досягає 140 кілометрів за годину.

A. The technnical speed at separate divisions reaches 140 km/h.
B. The technological speed at every division reached 140 km/h.
C. The technological speed at separate divisions reaches 140 km/h.
D. The technological speed at separate routes reaches 140 km/h.

4. Високошвидкісні залізниці залежать не тільки від колії, але й також від рухомої тяги і вагонів.

A. High speed locomotives depend not only on track but also on traction and carriages.
B. High speed railways depend not only on track but also on traction and carriages.
C. High speed railways rely not only on track but also on traction and carriages.
D. High speed railways depend not only on track but also on territory and carriages.

5. Який транспорт залишається практично єдиним надійним засобом сполучення у більшості регіонів країни?

A. What transport remains the only reliable means of communication for most of the country's regions?
B. What transport remains practically the only important means of communication for most of the country's regions?
C. What transport remains practically the only reliable means of communication for most of the country's regions?
D. What transport will remain practically the only reliable means of communication for most of the country's regions?

6. Деякі спеціалісти вважають, що електротранспорт – це вид транспорту, якому приділяють багато уваги.

A. Some specialists believe electric transport is the kind of transport to be given much attention to.
B. All specialists believe electric transport is the kind of transport to be given much attention to.
C. Some specialists believe electric transport is the kind of transport to have been given much attention to.
D. Some initiators consider electric transport is the kind of transport to be given much attention to.

7. Контрейлерні перевезення допоможуть залізниці ефективно конкурувати з іншими видами транспорту.

A. Piggy-back services will help to communicate effectively with other forms of transport.
B. Piggy-back services are helping to communicate effectively with different forms of transport.
C. Piggy-back services will help to communicate successfully with other forms of transport.
D. Piggy-back services will help the railway to compete effectively with other forms of transport.

8. Українські залізниці займають п'яте місце у світі за кількістю пасажирських перевезень.

A. Ukrainian Railways take the 5th place in the world for the amount of passenger shipment.
B. Ukrainian Railways performed the 5th place in the world for the amount of shipment.
C. Ukrainian Railways take the 5th place above the world for the amount of shipment.
D. Ukrainian Railways take the 5th place in the world for the amount of derailments.

9. Також існують плани щодо будівництва нових прямих високошвидкісних ліній, що з'єднають промислові центри.

A. There were also plans of building new high-speed straight lines, connecting industrial centers.
B. There are also plans of building new straight lines, connecting industrial centers.
C. There are also plans of building new high-speed straight lines, connecting industrial centers.
D. There are also plans for reconstruction new high-speed straight lines, connecting industrial centers.

10. У наш час найбільш цінні товари найчастіше перевозять автошляхами.

A. More frequently valuable goods are now usually transported by road.
B. Nowadays the most valuable goods are frequently transported by road.
C. Nowadays more valuable goods had to be frequently transported by cars.
D. Nowadays more valuable goods are frequently transported by road.

Key: 1b, 2 c, 3 c, 4 b, 5 c, 6 a, 7d, 8 a, 9 c, 10 d

GETTING PREPARED FOR CREDIT-TEST № 2

Translate into English applying the proper means of expression of different linguistic phenomena

1. Міським рейковим громадським транспортом є трамвай, легко-рейковий транспорт, приміська залізниця, фунікулер, монорейка, метрополітен. Трамвай є найстарішим рейковим вуличним транспортом. Легко-рейковий транспорт є сучасним втіленням трамваю, він має відокремлену колію, та, завдяки цьому, більшу швидкість. Метрополітен – електрифікована пасажирська залізниця на міській території із високою пропускною спроможністю. Метрополітен зазвичай прокладається під чи над поверхнею землі. Як транспортний засіб найчастіше використовують електропотяг на рейках, але деякі мережі використовують магнітну левітацію або монорейку. Метрополітен має більшу швидкість і перевізну спроможність, ніж трамвай або легкорейковий транспорт, але меншу, ніж приміська залізниця. Після будівництва метрополітену в Лондоні ця технологія швидко поширилась у містах Європи, пізніше у США та в Азії. Наразі 160 міст світу мають мережі метрополітену, загальною довжиною більше 8 000 км колії та 7 000 станцій. Варіантами метрополітену є монорейковий транспорт й легкорейковий транспорт, і гібрид з приміською залізницею є S-Bahn. (*1100 др.зн.*)

2. Хоча сучасні системи залізничного контролю повністю стандартизовані, особливо відносно технічного забезпечення, але системи повинні бути досить гнучкими, щоб пристосуватися до найрізноманітніших потреб. Передача сигналів лежить в основі будь-якої залізничної операції, і тому заслуговує на увагу переглянути те, як засоби сигналізації впливають на автоматизацію, і як вони застосовуються у системі управління залізничним рухом. Сутність передачі сигналів полягає у тому, що вони повинні забезпечити більш безпечне, безаварійне управління так само як забезпечити пунктуальне і надійне управління рухом поїзда. Головна мета заходів щодо забезпечення безпеки полягає у тому, щоб захистити людей, які подорожують, і полегшити

експлуатацію та ремонтні роботи для персоналу наскільки це можливо. Заходи щодо забезпечення безпеки також розроблені, щоб полегшити чіткі рішення персоналу, виявляючи і запобігаючи помилкам в управлінні. У цьому контексті стає зрозуміло, що широке використання автоматизації оптимізує надійність управління залізницею і, крім того, допомагає оптимізувати вимоги укомплектування персоналом. (*1112 др.зн.*)

3. Згідно з принципом централізованого контролю за рухом, усіма рухами поїздів керують від центрального пункту, де знаходиться велика освітлена панель із діаграмою усіх колій у підконтрольній ділянці. Під діаграмою є маленькі кнопки. Натискаючи кнопки, оператор змінює положення стрілок і сигналів. Велика кількість вогників на діаграмі показує диспетчеру розташування кожного поїзда. Розглядаючи розташування усіх поїздів у його ділянці на дисплеї, диспетчер може «пітримувати» рух поїзда з мінімальними, наскільки це можливо, затримками. Незважаючи на надійну систему сигналізації та високоефективні методи управління, нещасні випадки усе ще відбуваються на залізницях, особливо на високошвидкісних лініях. Дійсно, жоден машиніст не зможе з легкістю «прочитати» блок-сигнали легко, рухаючись зі швидкістю, скажімо, 200 км на годину. Погодні умови можуть також завадити водію розпізнати бокові колійні сигнали. Іноді самі водії не досить уважні. Це змусило залізниці докорінно змінити всю систему сигналізації. Ключ до вирішення проблеми управління рухом поїздів було знайдено в так званому напівавтоматичному керуванні рухом поїздів. (*1118 др.зн.*)

4. Залізничний транспорт – це перевезення пасажирів і вантажів у транспортних засобах на колесах, що рухаються по коліях. На відміну від автомобільного транспорту, де транспортні засоби просто пересуваються по підготовленій поверхні, залізничні транспортні засоби ще й безпосередньо спрямовуються колією. Рушійну силу забезпечують локомотиви, які або «беруть» електроенергію із системи енергозабезпечення електрифікованої

залізниці або виробляють «власну» енергію (як правило, дизельними двигунами). Залізничні вагони зазвичай локомотивами штовхають або тягнуть, хоча вагони можуть бути і самохідними. Залізниця – це надійний, дешевий, економічний вид наземного транспорту, здатний здійснювати великий обсяг інтенсивних перевезень. Залізничний транспорт порівняно з автомобільним транспортом має перевагу 10 до 1 щодо використання пального, щодо продуктивності праці персоналу, щодо необхідної потужності (кінських сил) локомотива для перевезення однієї тонни вантажу. Залізничний транспорт менш гнучкий і потребує більше капіталовкладень, ніж автомобільний. Однак, залізниці і зараз залишаються економічною основою багатьох світових держав. (*1138 др.зн.*)

5. Глобалізація економіки – це загальновизнаний факт, а не закон природи. Економіка була б звичайною справою, якби була ізольованим явищем. Ось чому повинна існувати певна стратегія в управлінні нею. Головний принцип управління сучасним транспортом полягає у тому, що він має бути вираженням волі, проінформованим знанням фактів. Сьогодні люди сприймають глобалізацію у певному ракурсі. У США залізниці є продуктом історичного розвитку і географічний контекст повністю відрізняється від того, який був у минулому. У Західній Європі залізниця діяла на правах соціального «організатора» і уряд, таким чином, завжди мав вплив і здійснював перевірку розвитку залізничної справи, і в цьому процесі часто з різних причин він створював міцні зв’язки фінансової залежності між залізницями і самим урядом. У цьому питанні потрібно встановлювати надійні партнерські стосунки з перевізниками, будь то залізниця або інші види транспорту, з метою задоволення зростаючої потреби в інтегрованих транспортних мережах. Треба заохотити співробітництво з іншими залізницями, щоб створити певний ефект від залізничної мережі, що є завжди вигідним для транспорту. (*1139 др.зн.*)

6. Проблема людини та її взаємодія із навколишнім середовищем стала однією із найскладніших проблем для багатьох наук, і не тому, що це модно, а тому що

вона надзвичайно значуща для усього людства. У даний час ми бачимо ознаки екологічного дисбалансу, який може призвести до кризи, якщо не будуть ужиті необхідні заходи. Повітря, яким ми дихаємо, земля, на якій ми живемо, і її річки і моря стають забрудненними ще більш небезпечними матеріалами – побічними продуктами діяльності людини. Збільшення рівня шуму є особливою проблемою у наші дні. Нам потрібна тиша, так само як потрібні свіже повітря та незабруднена вода. Шум спричиняє не тільки фізичні пошкодження слухача, але може послабити його енергійність і «зламати» його нерви. Транспорт є основним джерелом забруднення навколишнього середовища. У багатьох містах зараз занадто шумно, щоб жити. Забруднювачі є не тільки шкідливими для здоров'я, але і для будівель. У більшості міських центрів деякі з найстаріших і найкрасивіших будівель буквально «розвалюються» на шматки. З одного боку, фундаменти, стрясає від інтенсивного руху і, з іншого боку, цеглу роз'їдають викиди від вуличного руху. (*1145 др.зн.*)

7. Автоматизація залізниць підвищує ефективність і поліпшує безпеку. В даний час залізниці досягли підвищеного рівня автоматизації. Існує багато особливих пристроїв, які впливають на безпеку руху і ефективність експлуатації через покращення засобів автоматизації і сигналізації. Особливе значення має роль комп'ютера в організації дорожнього руху і сигналізації. Управління переміщенням вантажів також може отримати вигоду від автоматизації. Як правило, ці процеси включають у себе розташування і завантаження конкретних вантажних поїздів, керування даними щодо перевезень вантажів, відстеження вантажів у рухомому складі, вантажних терміналах, проведення колійних робіт, оптимізацію складання поїздів і оцінки усіх даних, що зберігаються в електронному вигляді, і представлення їх у зручному для використання форматі. Але автоматизація на цьому не закінчується. Планування усіх процесів може також бути вигідним. Спадають на думку – техніка моделювання та презентація складного, об'ємного статистичного матеріалу. Крім того, комп'ютерне програмне забезпечення може значно

полегшити проблему планування – логістики, а також зі складання розкладу і його перевірки. (*1160 др.зн.*)

8. Автоматизація залізниці підвищує продуктивність та покращує безпеку. Сьогодні залізниці досягають усе вищого і вищого ступеня автоматизації. Є багато факторів, які впливають на безпеку залізничних шляхів і спричиняють ефективність за сприянням кращої автоматизації та покращеної сигнальної системи. Особливе значення має роль комп'ютера в управлінні рухом і сигналізацією. Управління вантажоперевезенням також може бути корисним завдяки автоматизації. Звичайно, автоматизація б допомогла виявити місцезнаходження та завантаження спеціальних вантажних поїздів, в управлінні перевезеннями, у розміщенні рухомого складу, у вивантаженні вантажу у кінцевому пункті та у керівництві залізницею, в оптимізації формування поїздів і в оцінці всієї електронної інформації і у представленні її у легкому для використання форматі. Але автоматизація на цьому не закінчується. Планування на високому рівні може також принести прибутки – методи моделювання та презентація комплексного статистичного матеріалу набуває розмаху. Більше того, комп'ютерні програмні забезпечення можуть значно зменшити проблеми з кадровим складом; у логістиці, так само як і у складанні розкладу та здійсненні контролю. (*1182 др.зн.*)

9. Складання розкладу пов'язано не тільки з використанням колії. Серед інших, не менш важливих ресурсів залізниці, які розглядаються, звичайно є ефективне забезпечення рухомим складом, локомотивами та поїзними бригадами. Просто кажучи, кожний поїзд, передбачений планом, потребує певної кількості вагонів, локомотив і поїздну бригаду. Жодна частина планування не може виконуватись окремо, і навіть для невеликої зміни потрібно взяти до уваги наявність пасажирських вагонів і локомотивів. Простим наочним прикладом є ситуація зі складом пасажирських вагонів при обслуговуванні електрифікованої ділянки Манчестер-Ліверпуль. На цьому маршруті використання рухомого складу набуло великої ефективності – багато залізничних поїзних складів здійснюють

по чотири поїздки кожного дня, регулярно долаючи відстань майже в 800 миль. Інші поїзні склади роблять тільки по дві або три поїздки. Таким чином, нещодавно було прийнято рішення, спрямоване на задоволення громадських потреб у користуванні ранковими поїздами. Щоб унукнути проблем із рухомим складом і довезти людей до їх місця призначення до 09.30, необхідно планувати ранкові поїздки заздалегідь, включаючи їхні від'їзди приблизно о 7.00. (*1182 др.зн.*)

10. Залізниці успішно конкурують з іншими видами транспорту. Високошвидкісні залізничні магістралі (ВЗМ) мають перевагу перед автомобілями, в тому, що вони можуть перевозити пасажирів зі швидкістю набагато швидшою, ніж автомобілі. Межа нижнього обмеження швидкості ВЗМ (200 км/год або 125 миль/год) є значно вищою, ніж обмеження для автомобільного руху в будь-якій країні. Ігноруючи декілька країн без загального обмеження швидкості, обмеження швидкості рідко є вищим за 130 км/год (80 миль на годину) для подорожей, які з'єднують центр міста з передмістями. Перевага ВЗМ збільшується завдяки низьким обмеженням швидкості в більшості міських районів. Як правило, чим довший пробіг, тим краща перевага в часі для залізниць, якщо вони проходять у тому ж напрямку. У той час як в комерційних швидкісних електропоїздах максимальна робоча швидкість є набагато повільнішою, ніж у реактивних літаках, вони мають переваги перед авіаперевезеннями у більшості випадків на відносно коротких відстанях, і можуть бути невід'ємною частиною транспортної системи. Вони також з'єднують міські центральні залізничні центри з кількома іншими центральними залізничними станціями (з проміжною зупинкою для посадки/висадки пасажирів, з інтервалом 3-8 хвилин). (*1232 др.зн.*)

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