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Контрольні завдання з англійської мови для студентів – заочників технічних спеціальностей

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Розглянуто
на засіданні кафедри СГП
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Методична розробка містить загальні положення , перелік навчального матеріалу, передбаченого програмою, контрольні завдання, додаткові тексти для підготовки до іспиту, а також список рекомендованої літератури.

Рецензент:
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Зміст

Загальні положення

Вивчення дисципліни “Англійська мова” студентами напряму підготовки 6.050702 (Електромеханіка) і 6.050502 (Інженерна механіка) проводиться у відповідності до типової програми, методичних вказівок і контрольних завдань для студентів-заочників вищих закладів освіти немовних спеціальностей.

Мета навчання англійської мови у технічному вузі – це підготовка студентів до мовленнєвої діяльності іноземною мовою, що передбачає наявність практичних, професійно-орієнтованих навичок, які після закінчення курсу нададуть їм можливість читати оригінальну літературу за спеціальністю для вилучення необхідної інформації; приймати участь в усному спілкуванні англійською мовою в обсязі матеріалу, передбаченого програмою.

Практичні завдання під час вивчення курсу.

Граматика. Вивчення і закріплення в усному і письмовому мовленні мовних явищ згідно програми.

Лексика. Засвоєння нового лексичного матеріалу відбувається у двох напрямках:

а) за темами, що пов’язані з майбутньою професією студентів (активне опанування термінологією на базі текстів за фахом);

б) за розмовними темами.

В умовах заочного навчання такі види мовної діяльності, як усна мова (мовлення й аудіювання) та письмо використовуються протягом усього курсу як засіб навчання. Переклад (усний і письмовий) застосовується: а) як засіб навчання, б) для контролю розуміння прочитаного, в) як можливий засіб передачі отриманої при читанні інформації.

Для того, щоб досягти успіху у вивченні англійської мови, необхідно розпочати роботу над мовою з перших днів навчання і займатися систематично.

Самостійна робота студентів з оволодіння іноземною мовою охоплює вивчення слів англійської мови, розуміння дії правил словотворення, граматичних правил, читання професійно-орієнтованих текстів англійською мовою вголос відповідно правил читання, слухання аудіо-текстів для того, щоб навчитися правильно вимовляти і сприймати на слух зміст повідомлення, розвиток навичок в побудові запитань та відповідей до текстів, переклад українською мовою (усний і письмовий); надалі – читання, переклад, анотування газетних текстів, літератури за фахом з метою вдосконалення практичних мовленнєвих навичок і розширення лексичного запасу, розвитку вмінь вилучати необхідні дані з контексту, оперувати англомовною інформацією.

Протягом навчання студенти виконують контрольні роботи:

дві (напрям підготовки – 6.050702: Електромеханіка) і

чотири (напрям підготовки – 6.050502: Інженерна механіка).

Види і форми контролю.

Студенти вищевказаних напрямів підготовки складають залік (I семестр) та іспит (II семестр). Іспит передбачає:

1) читання і переклад тексту за фахом (науково-технічна література);
2) анотування газетного (науково-популярного) тексту;
3) бесіду за темою.

Навчальний матеріал з англійської мови.

1. Структура речення в англійській мові порівняно зі структурою речення в українській мові. Розповідне, питальне та заперечне речення. Типи питань.
2. Дієслово. Допоміжні, питальні та смислові дієслова.
3. Спосіб (дійсний, умовний, наказовий). Система часів.
4. Активний і пасивний стан. Особливості використання і перекладу пасивного стану. Узгодження часів.
5. Безособові форми дієслова. Дієприкметник, функції та способи перекладу. Інфінітив, функції та способи перекладу. Герундій, функції та способи перекладу.
6. Модальні дієслова та їх еквіваленти.
7. Умовний спосіб. Емфатичні конструкції.
8. Функції дієслів: to be, to have, to do, will, should, would. Функції дієслів із закінченням -ing, -ed.
9. Іменник. Утворення множини. Присвійний відмінок.
10. Артикль.
11. Займенник (загальні відомості). Особові, присвійні, вказівні займенники. Неозначені займенники some, any і заперечний займенник no. Кількісні займенники many, much, few. Неозначено-особовий займенник one. Три функції one. Підсилювальні та зворотні займенники.
12. Прикметник. Прислівник. Ступені порівняння.
13. Числівник. Кількісні та порядкові числівники. Дріб. Читання формул, хронологічних дат, позначень часу.
14. Граматичні особливості перекладу (артикль, іменник, прикметник, числівник, займенник, дієслово, прислівник, прийменник, сполучник). Конструкції типу the more, the better, there + be.
15. Синтаксичні особливості перекладу (умовне речення, неозначено-особові та безособові речення, безсполучникові підрядні речення, складнопідрядні речення, інверсія та ін.).
16. Лексичні особливості перекладу (багатозначність, конверсія, синонімія, неологізми, "фальшиві друзі перекладача", британський та американський варіанти англійської мови, терміни, уживані вирази та службові слова, іншомовні запозичення, абревіатури, умовні позначення, власні назви, англійська система мір та ваги тощо).
17. Жанрові особливості перекладу.

18. Найвживаніші суфікси, префікси англійської мови науково-технічної літератури та їх значення. Основні суфікси іменників, прикметників, дієслів, прислівників.

Контрольне завдання 1

Щоб вірно виконати завдання 1, необхідно засвоїти такі розділи курсу:

1. Іменник. Множина. Артиклі та прийменники як показники іменника. Вираз відмінкових відносин в англійській мові за допомогою прийменників та закінчень - s. Іменник у функції означення та його переклад українською мовою.
2. Прикметник. Ступені порівняння прикметників. Конструкції типу *the more… the less*.
3. Числівники.
4. Займенники – особові, присвійні, питальні, вказівні, неозначені та заперечні.
5. Форма теперішнього (Present), минулого (Past), і майбутнього (Future) часу групи Simple (Indefinite) дійсного стану (Active Voice) дійсного способу. Наказовий спосіб та його заперечна форма.
6. Просте поширене речення: прямий порядок слів розповідного та спонукального речення у стверджувальній та заперечній формах. Зворотній порядок слів (інверсія) питального речення. Зворот *there + be*.
7. Основні випадки словотворення.
8. Дійсний та пасивний стан дієслова (Simple Tenses).

Test 1
Variant I

I. Translate the text.

Pavel Yablochkov.

Pavel Yablochkov was born in Saratov Province on September 26, 1847. When fourteen years old, the boy was taken by his parents to Petersburg. Having finished school, he entered the Military Engineering College and later the Electrotechnical School for officers. After graduating he gave up the lucrative post of a military engineer and continued to perfect his knowledge in electrical engineering.

At this period of life Yablochkov moved to Moscow and worked as a chief of the telegraph office on the Moscow-Kursk railway. He organized a physical laboratory and workshop of his own. It is there that he spent all his free time studying electrical

phenomena. Later he lived for some years in Paris and there he carried on his scientific and experimental work.

The practical application of the electric arc for lighting purposes begins with Yablochkov. Before him it had seemed impossible because the carbon rods between which the arc had to be formed burned out too quickly. The only man who found a solution to this most difficult problem was Yablochkov. He achieved it by placing the two carbon electrodes parallel to each other instead of placing them end to end as other electricians had done before him. On March 23, 1876, Yablochkov received the French patent for his "candle" or "Russian candle" as it was generally called.

While working with his candle Yablochkov was the first to realize the advantages of a transformer. He employed a single-phase a.c. transformer with a broken magnetic system. He was also the first scientist who was fully aware of the advantages of the alternating current system and widely used the a.c. for practical purposes. Before him that kind of current had been employed for laboratory work alone. [3: 92]

II. Make up questions to the underlined words.

III. Answer the following questions to the text.

1. What higher educational institution did Yablochkov graduate from?
2. Where did Yablochkov study electrical phenomena when he lived in Moscow?
3. What did he receive the French patent for?
4. Why had the practical application of the electric arc for lighting purposes seemed impossible before Yablochkov?
5. In what way did Yablochkov manage to make his "candle" more durable?

IV. Translate the following sentences into English.

1. Після закінчення школи електротехніки Яблочков продовжував удосконалювати свої знання і проводити весь свій вільний час, вивчаючи електричні явища.
2. Яблочков провів безліч експериментів і застосував електричну дугу для освітлення.
3. В електричній „свічці" Яблочкова два вуглецевих електроди було розташовано паралельно.
4. Яблочков першим зрозумів переваги трансформатора.

V. Open the brackets and supply the correct form of adjectives. Translate the sentences.

1. Susan is (old) than Mark, she is the (old) in the family.
2. It is (hot) in Athens than in London, it is not as (hot) in Oslo as it is in London. Which of the three cities is the (hot)? Which is the (cold)?
3. Their house in the country is (little) comfortable than their flat in the town.
4. Yesterday our team played football very badly. I think it was their (bad) match.

5. I don't like these pictures. They are too dark. I saw (good) pictures in a shop in our street.

V. Translate into your native language paying attention to the peculiarities of Passive constructions.

1. On entering the classroom the teacher *was greeted* by his students.
2. Their mail *is delivered* after noon every day.
3. All flights *must be cancelled* because of fog.
4. He *was not offered* the job he hoped for.
5. I expect that I *shall be given* a good piece of advice how to do it.

VI. Change the sentences from Active into Passive.

1. My brother brought me this letter. – This letter …
2. They will discuss the report next week. – The report …
3. We hear the sounds of music in the hall. – The sounds …
4. I didn't solve this difficult problem. – This difficult problem …
5. Mr. Smith must sign this document. – This document …

VII. Supply the correct grammar tenses. Translate the sentences.

1. I (read) this book when I was at school. I (like) it very much.
2. My neighbour (be) about 70 now but he still (work). When he (be) young he sometimes (work) even at nights.
3. I hope I (finish) my work by the end of this month.
4. Alfred Nobel (come) to Sweden after his long life in Russia in 1863.
5. Some days ago a team of experts (come) to the enterprise to study the present situation.

VIII. Choose the correct grammar form. Translate the text.

In Ukraine great attention (is paid, was paid) to engineering education. Much (depends, depended) on today's students. They (have to, will have to) cope with the tasks which the country will set before them. Students graduating from higher mining schools (are, will be) tomorrow's mechanical engineers, electrical engineers etc. Laboratory work (was, is, will be) an important part in training specialists. Experiments in laboratories and workshops (helped, help) students to develop their practical skills. Students (went, go) through practical training at mines, plants and other industrial enterprises. They (became, become) familiar with all stages of production and every job from worker to engineer. Here they (got, get) practical knowledge and experience necessary for their diploma papers. Today a student (was to, is to) get a much greater amount of new information and this amount (was, is) growing all the time. Engineers of a new type (can, cannot) be trained apart from modern production, science and technology.

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Test 1

Variant II

I. Translate the text into your native language.

Pioneers of Russian electrical engineering.

Today more and more is done by electricity. It is used everywhere: in our plants and factories, in the fields, on transport and in our homes. Electricity gives us music and news by radio. It does hundreds of other things. The wide application of electricity in the national economy and everyday life has become possible thanks to the rapid growth of electrical engineering, which began in the second half of the 19th century.

The pioneers of Russian electrical engineering were Yablochkov and Lodygin – two great Russian scientists and inventors. Yablochkov's electric candle which had been called "Russian candle", "Russian light" was the beginning of the practical application of the electric arc for lighting purposes. Working at his invention, Yablochkov recognized the advantages of the a.c. He was the first to design the a.c. transformer and put it into practice. Yablochkov's great technical achievements opened a way for a much more efficient source of light – the incandescent filament lamp. The idea of this lamp belongs to Lodygin. He devoted almost all his life to the perfection of his invention. He was never satisfied with his achievements. He constructed a number of incandescent lamps. He carried out a series of experiments to find the best metal filaments with a high melting point. It was his idea to introduce tungsten filaments in vacuum. This invention was of world importance. It gave rise to a real advance in the field of electric lighting.

Like many other scientists and inventors, Yablochkov and Lodygin got neither support nor help from the tsarist government. They died in great need. [3: 94]

II. Make up questions to the underlined words in the text.

III. Answer the following questions to the text.

1. What was the beginning of the practical application of the electric arc for lighting purposes?
2. What did Yablochkov recognize working at his invention?
3. Who was the first to put the a.c. transformer into practice?
4. Who does the idea of the incandescent filament lamp belong to?
5. Why was the invention of introducing tungsten filaments in vacuum of world importance?

IV. Supply the correct form of the adjectives. Translate the sentences.

1. Summer is (warm) than winter. It is the (warm) of the four seasons.
2. It is (well) to go there by plane, it is much (quick) than by train.
3. In spite of the fact that trains often follow each other within seconds, the London underground is the (safe) form of transport in the world.

4. In the old days when colleges were institutions, the students' life was much (strict and disciplined) than now.
5. The icebreaker is equipped with all the (late) navigation instruments.

V. Translate into your native language paying attention to the peculiarities of Passive constructions. Define the tenses.
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*.
VI. 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 …

VII. Supply the correct tenses. Translate the sentences.
1. As long as we live we (continue) to learn, and the education we (receive) when we are young (help) us to continue learning.
2. He (be) a good student, we hope that he (pass) all his exams well in January.
3. This is the house my friend (live) in.
4. Architecture (be) the art which (make) buildings beautiful to look at as well as useful.
5. The documents were handed over to the writer who (want) to include them into his novel.

VIII. Open the brackets using the Simple Past, Present and Future Tenses. Translate the text.
Our life today (depend) very much on energy. In towns and in villages, on farms and in factories, machines (make) life easier than it used to be. The machines (use) energy, factories and industrial plants (too use) it to make the things that we (buy). But the world's supplies of energy (become) less. Countries with a lot of industry — like the United States of America, Japan and Western Europe (depend) on energy more and more. The United States (have) 6 per cent of the world's people, but each year (it) (use) more than 30 per cent of the energy that the world (produce). The three areas together (have) 19 per cent of the people of the world but (use) nearly 60 per cent of the world's energy. Now suddenly, we (find) that there is not enough energy. We (search) for sources of energy all over the world but we (not to find) it fast enough. But if we (discover) an endless source of energy, we (be able) to use it? The answer (be) that we must be careful. When we (use) energy of any kind, we (produce)

heat: we (make) the Earth a little warmer. We can change the climate. It (be) clear that we (to have to stop) the increase in the use of energy.

Контрольне завдання 2

Щоб вірно виконати Завдання 2, необхідно засвоїти розділи курсу англійської мови з обраного підручника:

1. Видо-часові форми дієслова: а) дійсний стан форми Indefinite (Present, Past, Future); форми Perfect (Present, Past, Future); форми Continuous (Present, Past, Future); б) пасивний стан – форми Indefinite (Present, Past, Future); Особливості перекладу пасивних конструкцій.
2. Модальні дієслова: а) що виражають можливість: can (could), may і еквівалент дієслова can – to be able to; б) що виражають повинність: must, його еквіваленти to have to, to be to, should.
3. Прості неособові форми дієслова: Participle I (Present Participle), Participle II (Past Participle) у функціях означення та обставини. Gerund – герундій: прості форми.
4. Означальні та додаткові підрядні речення (сполучникові); підрядні обставинні речення часу й умови.
5. Інтернаціональні слова.

Test 2

Variant I

I. Read and translate the text.

Nature of electric current.

In the modern conception of the constitution of matter it is composed of atoms. The atom is made up of a positive nucleus surrounded by negative charges of electricity, called electrons, which revolve about the nucleus at tremendous speeds. The nucleus consists of a number of protons, each with a single positive charge, and, except for hydrogen, one or more neutrons, which have no charge. The atom is neutral when it contains equal numbers of electrons and protons. A negatively charged body contains more electrons than protons. A positively charged body is one which contains fewer electrons than its normal number.

When the two ends of a conductor are connected to two points at different potentials, such as the terminals of a battery, we say that there is an electric current in the conductor. What actually happens?

The conductor has equal numbers of positive and negative charges in its atoms, and we want to know how the charges can be made to produce a current. The atoms in metals are packed so closely that they overlap to some extent, ' so that it is comparatively easy for the outer electrons to pass from one atom to another if a small force is applied to them. The battery causes a potential difference between the ends of

the wire, and thus provides forces that make the negative electrons in the wire move toward the point of higher potential. This electron flow toward the positive electrode is the electric current. Naturally materials differ considerably in the ease with which electrons can be made to migrate from atom to atom.
The current will not flow unless there is an electric circuit. The magnitude of the current depends simply on the rate of flow of electrons along the conductor. [5: 138]

II. Answer the following questions to the text.

1. What is an atom?

2. When is the atom neutral?

3. What is a negatively charged body?

4. What is a positively charged body?

5. What is an electric current?

6. What does the magnitude of the current depend on?

III. Make up the questions to the underlined words.

IV Use the Simple Past or Present Perfect. Translate the sentences into your native language.
1. I (begin) … a new diet and exercise program last week. I (begin) … lots of programs and diets in my lifetime.
2. The radio (broadcast) … news about the terrible earthquake in Iran last week. The radio (broadcast) … news about Iran every day since the earthquake occurred.
3. Becky is a commercial airline pilot. Yesterday she (fly) … from Tokyo to Los Angeles.
4. Garry (fly) … to many places in the world since he became a pilot.

V. Use the Past Simple, Present Perfect or Past Perfect.
1. A: Oh, no! We are too late. The train (leave, already) … B: That's okay. We'll catch the next train to London.
2. Last Saturday we went to the station to catch a train to Bristol, but we were too late. The train (leave, already) …
3. About twenty people (arrive, already) … when they (enter) … the hall.
4. There (be) … a curious expression on his face I never (see) … before.
5. Yesterday I approached a stranger who looked like Amanda and started talking to her. But she wasn't Amanda. It was clear that I … (make) a mistake. I was really embarrassed.
6. At last I … (translate) the article: now I shall have a little rest.

VI. Put the verbs in brackets into the Passive Voice. Translate the sentences

1. The printing press (invent) … in the fifteenth century.
2. Italy and France (visit) … by millions of tourists every year.
3. Soon he (send) … to a sanatorium.
4. Today rugby football (play) … in many countries.
5. This type of TV sets (produce) … in Japan.

VII. Insert the necessary modal verb *(can, could, be able to, needn't, may, must, mustn't).* Translate the sentences.
1. Cactus plants … much water.
2. Cactus plants … grow in the dry desert.
3. Mozart … play the piano when he was three.
4. You will … go there tomorrow.
5. You … smoke in the classroom.
6. … I borrow your dictionary?
7. You … have a visa to enter some countries.

VIII. Fill in the blanks with the correct forms of the verbs *be, have*. Translate the text.
People ... used calculating devices since ancient times. The first electronic digital computer... built in 1946. The large room … filled with the computer. Since then rapid improvement in computer technology ... led to the development of smaller, more powerful, and less expensive computers. But computers ... not able to think. A user ... to tell the computer in very simple terms exactly what to do with the data it receives. A list of instructions for a computer to follow ... called a program.

Test 2
Variant II

I. Read and translate the text.

The main units in electrical engineering.

The main units in electrical engineering are those relating to current, pressure or voltage, resistance, power and energy.
Current is that which flows along the conductors forming the electric circuit. It is measured in amperes. Pressure, potential, voltage, or electromotive force is that which causes a current to flow between two points when they are joined by a conductor. The unit is the volt.
The total pressure generated by a cell or generator is called its electromotive force (e.m.f.). The difference in pressure between any two points in a circuit is simply known as the potential difference, voltage, or pressure of the circuit. The opposition which a substance offers to the flow of current through it is called its resistance. Substances having a small resistance, such as metals and most liquids, are called conductors, those offering a high resistance are called insulators. The unit of resistance is the ohm..

When resistances are connected in succession to form a circuit, they are said to be connected in series. The total resistance of such a circuit is the sum of all the resistances. Resistances connected to the same terminals are said to be in parallel.
In a circuit in which a steady direct current is flowing there is a direct relation between the current, voltage, and resistance, temperature remaining constant, and this is expressed by what is known as Ohm's law.
The power in a d.c. circuit is found from the product of the amperes flowing in it and the pressure at its terminals. The unit of power is the watt. It is the power in a circuit when a current of one ampere flows under a pressure of one volt. The practical unit of electrical energy is the kilowatt-hour. It is the energy transformed in a circuit when the power is one kilowatt and the time taken is one hour. In general practice this value is spoken of as a unit, and is the basis of charges for electrical energy. [5: 140]

II. Answer the questions to the text.
1. What is an ampere?
2. What is a volt?
3. What is a watt?
4. What is the practical unit of electrical energy?
5. What is electromotive force?
6. What types of resistance connections do you know?

III. Make up questions to the underlined words.

IV. Use the Simple Past or Present Perfect. Translate.
1. Are you going to finish your work before you go to bed? – I (finish, already) … it. I (finish) … my work two hours ago.
2. Rita called me on the phone to tell me the good news. She (pass) … her final exam in English.
3. I couldn't think. The people around me (make) … too much noise. Finally, I gave up and left to try to find a quiet place to work.
4. Are you still waiting for Peter? He (come, not) … yet? He's really late, isn't he?
5. When we were on holiday the weather (be) … wonderful.

V. Use the Present Perfect or Past Perfect. Translate.
1. A: I'll introduce you to Mr. Brown at the meeting tonight. B: You don't need to. I (already, meet) … him.
2. Alex offered to introduce me to Mr. Brown, but it wasn't necessary. I (already, meet) … him.
3. It was one of the happiest afternoons he (ever, spend) … .
4. My brother is an experienced driver, but he (never, drive) … a bus or a big truck.
5. The woman was a complete stranger to me. I (never, see) her before.

VI. 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.

VII. Insert the necessary modal verb *(can, could, be able to, needn't, may, must, mustn't).* Translate the sentences.
1. In order to get married you … be sixteen.
2. Jane … still be in office, but she usually leaves before six.
3. You … make a noise in a library.
4. Horses … sleep standing.
5. You … wait for me.
6. Einstein … speak eight languages.
7. In a month you will … speak another language.

VIII. Choose the necessary form of the verbs *be, have*. Translate the text.
All digital computers (have, has) two basic parts: a memory and a processor. The memory (is, are) receiving data and holding them until they (is, are) needed. The memory (is, was) made up of a big collection of switches. The processor (is, was) changing data into useful information by converting numbers into other numbers. It reads numbers from the memory, performs basic arithmetic calculations, and puts the answer back into the memory. The processor (is, are) performing this activity over and over again until the desired result (is, was) achieved. Both the memory and the processor (is, are) electronic.

Контрольне завдання 3

Щоб вірно виконати контрольне завдання 3, необхідно засвоїти такі розділи курсу:

1. Складні форми дієприкметника (The Participle). Перфектний дієприкметник (The Perfect Participle). Вживання форм дієприкметника для вираження співвіднесеності часів.
2. Функції дієприкметника в реченні і способи його перекладу рідною мовою.
3. Вживання дієприкметника для утворення складних дієслівних форм.
4. Об'єктний предикативний дієприкметниковий комплекс. (The Objective Participle Construction).
5. Незалежний самостійний дієприкметниковий зворот (The Nominative Absolute Participle Construction).
6. Герундій (The Gerund), його форми і функції в реченні.

7. Порівняльна характеристика герундія (The Gerund) і дієприкметника теперішнього часу (The Present Participle).
8. Герундій та віддієслівний іменник. –Ing форми в англійській мові, їх функції в реченні, способи перекладу.

Test 3
Variant I

I. Read and translate the texts.

Transformers.

A transformer consists of two insulated coils of wire linked with a ring of iron. The coils are called high-voltage and low-voltage windings, or primary and secondary windings. The primary winding is connected to the source of energy, and the secondary is connected to the load. The high-voltage winding is designed for the higher voltage, and has the greater number of turns. The ring of iron is called the core.

Each coil consists of a number of loops of round or rectangular wire. Several strands may be used in parallel but electrically insulated from each other, from the core and from the other coil.

The core consists of thin sheets of high-grade silicon steel. The thickness depends somewhat on the frequency at which the transformer is to operate. The thickness commonly used for 60 cycles is approximately 0.014 in.

The primary function of a transformer is to transform electrical energy from one alternating voltage to another. To transform large amounts of energy with maximum efficiency, many factors must be considered in determining the materials, design, and arrangement of the primary and secondary coils and the core.

Electric generators and motors.

A device for converting mechanical energy into electric energy is called a generator. The function of a motor is just the reverse, that is, it transforms electric energy into mechanical energy. The enormous energy of steam engines, gas engines, and water turbines can now be transformed into electricity and transmitted many miles. The generator has revolutionized modern industry by furnishing cheap electricity.

The essential parts of a generator are: a) the magnetic field, which is produced by permanent magnets or electromagnets; and b) a moving coil of copper wire, called the armature, wound on a drum.

D. c generators are used for electrolytic processes. Large d. c generators are used in certain manufacturing processes, such as steel making. Generators of small capacities are used for various special purposes, such as welding, automobile generators, train lighting, communication systems, etc. [5: 148]

II. Answer the following questions to the texts.

1. What are the coils of wire linked with a ring of iron called?
2. What does each coil consist of?

3. What is the primary function of a transformer?
4. What is a generator?
5. How has the generator revolutionized modern industry?
6. What is the magnetic field of a generator produced by?

III. Make up the questions to the underlined words.

IV. Insert the necessary words from the brackets (voltages and currents, the source of energy, electricity, the load, a magnetic field, a drum).
1. The primary winding of a transformer is connected to … .
2. The secondary winding is connected to … .
3. The armature is a moving coil of copper wire wound on .. .
4. One of the essential parts of a generator is … .
5. Transformer is designed to change the alternating … .
6. The modern industry has been revolutionized by the generator supplying cheap … .

V. 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.

VI. Translate the following sentences paying attention to the Absolute Participle Construction.
1. The motor having been tested, we were sure that its performance would be perfect.
2. The physical law having been explained, a student was asked to give an example illustrating it.
3. This article deals with optical electronics, with particular attention being paid to laser.
4. The plan was discussed in detail, many workers taking part in this discussion.
5. With the temperature falling rapidly, we couldn't proceed with our experiment out of doors.

VII. Complete the sentences with a suitable gerund from the brackets (listening, asking, being asked, finishing, suffering). Translate the sentences.

1. The researchers were prevented from … their work on time.
2. He didn't mind … questions.
3. Some people prefer … to somebody else's opinion to forming their own.
4. Reporters can cause … to individuals by publishing details about their private life.
5. The teacher introduced a new subject by … questions related to it.

VIII. 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.

IX. Gerund or Participle? Translate the sentences.
1. *Designing* new *mining* machines engineers pay attention to geological conditions in the mines.
1. *Making* experiments the engineers applied special devices.
2. Metals *conducting* electricity are termed conductors.
2. Scientists *dealing* with the problems of electricity are power engineers.
4. *Being* a piece of earth-moving equipment, an excavator is used in open-cast mines.
5. *Speaking* about the problems of utilizing solar energy, we should stress their aim.
6. A device for *converting* mechanical energy into electric energy is called a generator.

Test 3
Variant II

I. Read the text and translate it.

Automation and automatic control.

"Automation" is a new word for a new purpose. Ordinarily automation is any improvement in the control of some activity or process by non-human, i.e. automatic means, but sometimes the term is defined more narrowly.

Automation has many sides. It includes, for example, developments that are no more than advanced mechanization — transfer-machines in engineering, many kinds of machinery for making finished goods, and mechanical equipment for handling and assembly. Machines of this kind are automatic in that they do the actual work on their own; the operators only watch them and correct them whenever they go wrong – when, for instance, tools wear out.

But automation can also mean automatic control of processes and machinery, and this is a very different thing from mechanization, though the two go together. Control is necessary in a vast number of processes in order to maintain the quality of a product when the operating conditions, such as temperature and pressure, change from time to time.

A system of automatic control usually consists of three basic units — one that measures, one that controls, and one that corrects. If, for example, the condition to be controlled is the temperature of a boiler, the measuring unit records what is happening to the temperature and tells the controlling unit, which compares the actual temperature with what it should be and then tells the correcting unit to adjust a steam valve and so correct the temperature.

Controlling instruments are pneumatic, mechanical or hydraulic, and electric. Electric or electronic units are fast and able to send signals over long distances so giving "remote" control.

Automatic control is perhaps best known in plants where production is continuous, such as oil-refineries, but it is also found in factories that produce in batches. [5: 155]

II. Answer the questions.

1. What is automation?
2. What is the purpose of automatic control?
3. What basic units does a system of control usually consist of?
4. What kinds of controlling instruments do you know?
5. What units are used to give "remote" control?

III. Make up the questions to the underlined words.

IV. Insert the necessary words from the brackets (computers, manufacture, instruments, machine tools, production, industry).

1. The transfer-machine is a series of …, each doing one operation automatically.
2. Automatic control is most advanced in … like chemicals, oil-refining and food-processing, where materials are easy to handle.
3. Control is highly automatic in the … of goods so different as iron and steel, cement and paper.
4. Electronic … have become very good at routine clerical work in offices and factories.
5. Controlling … are pneumatic, mechanical and electric.
6. Automatic control is best known in plants where … is continuous.

V. Choose the correct form of Participle. Translate the sentences.

1. The progress … (achieving, achieved) resulted in a remarkable technical improvement.

2. ‘Automation’ is a term … (signifying, signified) the use of machines to do the work that formerly had to be done by people.
3. …(working, worked) with this substances one must be very careful.
4. With the experiments … (having carried out, having been carried out), they started new investigations.
5. Have you heard of precision control devices … (having used, having been used) for controlling the manufacture during some industrial processes?
6. When … (extracting, extracted) coal is transported to the surface.
7. In all mines … (visiting, visited) new electronic computers are used.

VI. Translate the following sentences paying attention to the Absolute Participle Construction.
1. The mechanic repairing the motor at that time, I went to the chief engineer instead of him.
2. The problem being easy, the students solved it at once.
3. The dictionaries brought, we were given articles from the scientific journals for translating.
4. All the questions having been discussed, the meeting was declared closed.
5. The professor entered the lecture hall, the assistant following him.

VII. Complete the sentences with a suitable gerund from the brackets (discussing, repairing, asking, answering, completing). Translate the sentences.
1. The old equipment badly needed … .
2. Before … our questions he made clear his point of view.
3. On … his research he published two papers.
4. One usually becomes aware of the problem by … why and how some process works.
5. Nowadays you can’t work out a new theory without … it with other people.

VIII. Choose the correct form of Active or Passive Gerund. Translate the sentences.
1. Jill’s low test score kept her from … (admitting, being admitted) to the university.
2. Mr. Brown gave no indication of … (changing, being changed) his mind.
3. I wondered at my father’s … (having allowed, having been allowed) the journey.
4. On … (telling, being told) the news she turned pale.
5. If you want to develop your inner tranquility, you have to stop … (being bothered, bothering) by every little thing that happens.
6. We know of our engineers … (having developed, having been developed) several types of winders.

IX. Gerund or Participle? Translate the sentences.
1. Hard coal is suitable for domestic *heating* and for *firing* boilers on ships.
2. Man realized the *heating* quality of coal long ago.

3. Coals rich in volatile matter are selected for *producing* coal gas.
4. Our scientists and engineers are steadily *improving* new types of earth-moving equipment.
5. *Compiling* a program requires great attention of a programmer.
6. Computer is a million times faster than humans in *performing computing* operations.

Контрольне завдання 4

Щоб вірно виконати контрольне завдання 4, необхідно засвоїти розділи курсу англійської мови з обраного підручника:

1. Інфінітив, його форми та функції в реченні. (The Infinitive, forms and functions). Модальні дієслова в сполученні з інфінітивом. (Modal verbs with The Infinitive).
2. Звороти з інфінітивом, що рівнозначні підрядним реченням:
   - Об'єктний інфінітивний комплекс (Complex Object Construction);
   - Суб'єктний інфінітивний комплекс (Complex Subject Construction).
3. Умовний спосіб дієслова (Conditional Mood).Умовні речення трьох типів (First Conditional, Second Conditional, Third Conditional). Інверсія в умовних реченнях.
4. Складнопідрядні речення (Complex sentences).
5. Термінологія, інтернаціональні слова, абревіатури.

Test

Variant I

I. Read and translate the text.

Conveyors

There are four main types of conveyors. These are: rubber-belt conveyors, scraper chain conveyors, shaker conveyors, aerial ropeway conveyors.

Probably the most widely used conveyor is that of a rubber-belt type. The rubber belting, on which material is carried, is constructed of a number of layers, cemented together and covered by rubber. The fabric withstands the pull in the loaded belt caused by the friction of the rollers over which the belt moves; the rubber cover protects the fabric from wear.

The greater the length of the conveyor and the heavier the load to be carried, the greater is the number of layers in the belt. The speed and width of the belt depend on the job it has to perform.

Some belts travel at a speed of only some feet per minute, whilst others move at as much as 10 miles per hour, the width varying from a few inches to several feet.

The advantages of belt conveying are the continuous flow of material and high capacities. Moreover, these conveyors can be used on gradients too steep for lorries or trains.

On large conveyors a heavy pulley is introduced behind the driving drum to give the required added tension. Heavy-duty conveyors often have more than one driving drum as this lessens the possibility of belt slip and decreases the amount of added tension.
Conveyors are usually driven by electric motors, though compressed-air motors are sometimes used, especially if the conveyor is installed in a place where the use of electricity is considered to be dangerous, such as a coal mine or a factory manufacturing explosives. [5: 229]

II. Answer the following questions.
1. What is a conveyor?
2. What types of conveyors do you know?
3. What type of conveyors is the most widely used?
4. What are the advantages of belt conveying?
5. What are conveyors usually driven by?

III. Make up the questions to the underlined words.

IV. Translate the sentences. Underline the Infinitive, define its form and function.
1. To understand many complicated phenomena in terms of a few principles physicists develop theories.
2. The amount of computations to be done is great.
3. To interpret these results in terms of the new concept is rather difficult.
4. Here are some data to be compared to understand the problem.
5. They must be testing the results.
6. They must have completed the experiment.
7. This research team must go on with the measurements.

V. Complex Subject. Underline it and translate the sentences.
1. Close cooperation between scientists and scientific institutions all over the world *is considered* to be one of the most striking characteristics of modern sciences.
2. He *is supposed* to be an experienced engineer.
3. These phenomena *are believed* to be interdependent.
4. This discovery *proved* to be the result of a long and thorough investigation.
5. This device *appears* to be of some interest. It *is likely* to be used in the experiment.
6. The earth *is said* to have been part of the Sun.

VI. Complex Object. Underline it and translate the sentences.
1. The director made the researchers work hard.
2. We know Galileo to have constructed the first air-expansion thermometer.
3. The professor expected the students to have made the necessary measurements.

4. We consider the nineteenth century physics to be the great achievement of the human mind.
5. I doubt them to become investigators soon.
6. They say devices for accepting information to have been described in some scientific magazines.

VII. Conditional sentences.

a) define the types of conditional sentences and translate them into your native language.

1. If we had expected them to come, we should have stayed at home.
2. He would be pleased if you stayed a little longer.
3. I'll be very happy if I see my parents.

b) put the verbs in brackets into the correct tense forms.

1. Many people were not satisfied with the leader after he took office. If they (know) more about his planned economic programs, they (not to vote) for him.
2. If he (not to read) so much, he would not be so clever.
3. If he (not to pass) his exams, he will not get a scholarship.
4. If you … (come) on holiday with us, you would have a wonderful time.
5. If my car … (not break down), I … (be) here at 8 o'clock.
6. If she spoke more slowly, perhaps I … (understand) her.

c) complete the sentences.

1. If I had a chance to work abroad, I …
2. If I thought of a good way of saving own money, I …
3. If prices go up next year, …

Test 4
Variant 2

I. Read and translate the text.

Winding machines

Winders are used for raising large outputs from great depth. Two methods are used for transporting minerals through mine shafts: by cages, carrying the coal in tubs or mine cars; and by skips, into which the mineral is loaded direct.

Cage winding, with mineral loaded into pit tubs, has been the standard practice for many years. In early days of mining, when minerals were worked entirely by hand, the pit tubs were taken to the face to be filled direct. Consequently, pit tubs were small, holding only 4 to 6 cwt, or even less; they were usually constructed of wood and were manhandled. The development of coal-cutting machines, conveyors, and mechanical loaders led to an increase in size of tubs.

The winding of mineral in skips has received much attention in recent years. In this system of winding mineral is discharged from the tub or mine car at the shaft bottom by tipping it into hoppers, from which it is loaded into the skip in bulk and sent (wound) to the surface.

For raising large outputs from great depths, the size of the rope becomes so large as to give rise to difficulties in manufacture and handling. Difficulties arise when the diameter of the rope required exceeds about 2.25 in.
During recent years the problem of rope size has been solved by the introduction of multi-rope friction winding, in which two or more smaller ropes are substituted for a single rope previously employed. [5: 231]

II. Answer the following questions.
1. What are winding machines used for?
2. What are two methods used for transporting minerals through mine shafts?
3. What did the development of coal-cutting machines, conveyors, and mechanical loaders lead to?
4. How is mineral discharged in skips winding?
5. How has the problem of rope size been solved during recent years?

III. Make up the questions to the underlined words.

IV. Translate the sentences into your native language. Underline the Infinitive, define its form and function.
1. To introduce computational physics is the subject of our studies.
2. To introduce it successfully we are to see what computational physics is.
3. We have got one more problem to solve today.
4. There is one more phenomenon to be involved into this solution.
5. He must work on his graduation paper to get better results.
6. He must be working in the laboratory now.
7. He must have finished his scientific report.

V. Complex Subject. Underline it and translate the sentences.
1. A diesel engine *is considered* to be a form of internal combustion engine.
2. The name 'heat engines' *is known* to include many types of engines and turbines.
3. The engine *is said* to be a source of power.
4. Heat engines *are supposed* to lose much heat energy when they do mechanical work.
5. Computers are sure to solve almost any problem faster and more efficiently than we can. However the mental capacity of computers *is unlikely* to reach human level in the nearest future.
6. The French mathematician Pascal *is known* to have constructed the first mechanical calculator.

VI. Complex Object. Underline it and translate the sentences.
1. The manager wants this work to be done.
2. We know Popov to have invented the radio in 1895.

3. How can I make this machine work?
4. We believe them to take interest in their future occupation.
5. The first investigator of heat found different substances to be heated to different degrees by the same amount of coal.
6. They say the computer to be the most amazing achievement of mankind.

VII. Conditionals.
a) define the types of conditional sentences and translate them into your native language.
1) If she had been excited she could not have passed the exam so successfully.
2) If the weather were fine we should have a very good time in the country.
3) If I understand the market properly I shall not fail.
b) put the verbs in brackets into the correct tense forms.
1) Let's take a taxi to the railway station. We have very much luggage. If we … (not to have) so much luggage, we … (to walk).
2) If he (to work) hard, he would have achieved great progress.
3) If my sister doesn't go to the south, we (to spend) summer in Kyiv together.
4) I … (sell) my car if I needed money.
5) I … (come and see) you tomorrow if I have time.
6) … you … (help) me if I ask you?
c) complete the sentences.
1) If I had a serious disagreement with my boss, I …
2) If I were a very rich person, I …
3) If I go to London, I … .

Supplementary texts

Text 1

Lighting in mines

In nearly all mines the miner carries his light with him. Formerly this was a simple oil-lamp, which was used where there was no danger of fire-damp. Today lamps with carbide are in use. They are used because the light they give is very bright. But the lamp has to be cared for during work.

Electric lamps provided with a small accumulator, which is charged in the lamp-room, are also used. They have a good lighting power, but they are heavy.

In mines with firedamp it is necessary to use either electric lamps or safety-lamps. Its flame is surrounded on all sides by a dense wire netting, which prevents the flame from penetrating outside and thus igniting an inflammable mixture outside the lamp. In order that the worker should not be able to open such a lamp at will, it is provided with a magnetic or other type of lock, which can be opened only in the

lamp-room with a strong magnet. In the lamp-room the lamps are also filled with fuel and maintained.

Of course, a safety-lamp cannot be lighted with a match or a lighter. Therefore it has to be equipped with a mechanism so that it can be lighted from within.

Electric lamps are very good for mines with firedamp, because their lighting power is great and their safety complete, but they have the great disadvantage that they do not warn the miner of the increasing content of methane in the air. For this reason the overmen and blasters still have safety-lamps even in mines where electric lamps are generally used, so that they can test the composition of the air at all times. Gas-detector electric lamps are being developed, however. [3: 176]

Answer the questions to the text

1. Why are lamps with carbide used today?
2. What is the disadvantage of the electric lamp?
3. Where are accumulators for electric lamps charged?
4. Why are safety lamps provided with a lock?
5. How can the overmen and blasters test the composition of the air?

Text 2

Ventilation in mines

Since men work in mines, a mine has to be ventilated like any other workroom. The air in mines is contaminated not only by the respiration but also, and to a greater extent, by the rotting of timber and the oxidation of carbonaceous matter, and by the use of explosives which may give off poisonous fumes. Accumulations of methane are sometimes stored under pressure in porous rocks.

Carbon dioxide is not only formed by oxidation of timber, coal, and other carbonaceous matter in the workings, but it may already exist in the strata. Some rocks contain hydrogen, especially in the neighbourhood of salt deposits. From this it is evident that the composition of the air in a mine differs somewhat from the composition of the air on the surface.

The purpose of ventilation is to remove the contaminated air and to introduce fresh air.

The purpose of ventilation is first of all to provide a sufficient quantity of air for respiration, and secondly to dilute objectionable gases, vapours and dust. Sometimes it is also necessary for lowering of the air temperature. All deep mines have to contend with high temperature, and much heat is developed in some coal mines by the oxidation of the coal.

Some mines do not require artificial ventilation, the natural flow of air being sufficient.

In large mines natural ventilation is not sufficient, and the air current has to be assisted by fans. This especially refers to coal mines and to mines where methane or carbon dioxide penetrate into the workings and where much dust is produced.

The function of the fan is to increase the flow of air through the mine airways overcoming the resistance of the workings and inertia of the air. A mine ventilated in this way must obviously have two openings, so that the air current may enter in one place, flow through the mine and leave the mine by the second opening. Thus, mines with artificial ventilation must have at least two shafts, one to act as a downcast, and the other as the upcast. [3: 133]

1. What is the air in mines contaminated by?
2. What is carbon dioxide formed by?
3. Why do some mines not require artificial ventilation?
4. What is the function of a fan?
5. What do all deep mines have to contend with?

Text 3

Care of the electrical equipment

As a rule electrical equipment operates reliably. Still it does not mean that it deserves no attention. It is necessary to give the equipment frequent inspections, keep it well cleaned, lubricated and repaired. Undue heating, vibration, sparking should be immediately removed.

Heating may be due to overload or to a short circuit between turns, lack of oil in bearings. Vibration may be due to unproper foundation, unbalance in the moving parts of the machine.

Conductors may get heated because of overload or by reason of damage of the insulation of the conductor.

An electrical machine of any kind requires certain conditions under which it may operate reliably: temperature and freedom of access of surrounding air, need for protection against dust, type and duration of load, etc.

Rotating machines should be placed on solid foundation.

Conductors should be protected against mechanical damage.

All measures of safely precaution must be undertaken. [3: 235]

1. What is care of the electrical equipment?
2. What may vibration be due to?
3. Why may conductors get heated?
4. What conditions does an electric machine require?
5. What damage should conductors be protected against?

Text 4

Electricity and magnetism

Much has been learned about electric currents through their effects. We all are familiar with incandescent filament in the ordinary electric lamp bulb (heating effect), with the vibrating hammer of the electric bell when ringing (magnetic effect), with the decomposition of acidulated water into hydrogen and oxygen (chemical effect), and

with the mechanical forces acting in the electric motor used for starting an automobile engine (mechanical effect).

Electricity is completely intermingled with magnetism. We must know these fundamental properties of a magnet well: a magnet attracts pieces of iron, nickel and cobalt; the magnetic property is concentrated more in the poles: if freely hung the magnetic needle sets itself with one pole toward the north; 'like poles repel each other, unlike poles attract each other; magnetism can be induced; a magnetic line of force is! the path along which an independent north pole would tend to move; a magnetic field is a space in which there are magnetic lines; permeability refers to the ease with which lines of force may be established in any material, and reluctance is the resistance which a substance offers to magnetic lines of force, i.e. to magnetic flux.

Many practical applications have resulted from the utilization of the magnetic effects of electric currents. These effects are employed in motors, in most electric meters (ammeters, voltmeters and galvanometers), in electromagnets, and in practically all electromechanical apparatus. [5: 141]

1. Give an example of mechanical effect of electric current.
2. What effect of electric current is incandescent filament in the ordinary electric lamp bulb?
3. What can a magnet attract?
4. How is electricity intermingled with magnetism?
5. Where are magnetic effects of electric currents employed?

Text 5

Branches of electricity

The study of electricity may be divided into three branches: magnetism, electrostatics and electrodynamics. Magnetism is the property of the molecules of iron and some other substances to store energy in a field of force. Electrostatics is the study of electricity at rest. Rubbing glass with silk produces static electricity. Electrodynamics is the study of electricity in motion, or dynamic electricity. The electric current which flows through wires is a good example of the latter type of electricity.

This flow of electricity through a conductor is analogous to the flow of water through a pipe. A difference of pressure at the two ends of the pipe is necessary in order to maintain a flow of water. A difference of electric pressure is necessary to maintain a flow of electricity in a conductor. Different substances differ in electrical conductivity because of the ease with which their atoms give up electrons. Electrical energy has intensity and quantity. Instruments have been devised which can be used to measure it in amperes and volts. [5: 142]

1. What branches may the study of electricity divided into?
2. What is electrodynamics?

3. What electricity will rubbing glass with silk produce?
4. What is necessary to maintain a flow of electricity in a conductor?
5. How do different substances differ in electrical conductivity?
6. What is the flow of electricity through a conductor analogous to?

Text 6
Cranes

In factories, works, plants and mines, in civil engineering, etc. a surprising amount of time is spent in simply moving things from one place to another. Today the high price of unskilled labour and the need to make the manufacturing processes as efficient as possible have made engineers study the possibility of material handling and develop many special pieces of equipment for moving things about.

To lift and transport loads from one position to another in all the industries cranes are used. Loads of 300 tons and upwards are handled by power-driven cranes controlled by operators manipulating various handles.

The size and structure of the crane, the speed of operation, the area of its operation, as well as its lifting capacity affect its design. Apart from small hoists used in engineering shops, all modern cranes are power-operated. Where the crane is a permanent unit of the plant, it is almost always electrically driven, since electric motors are smaller and more convenient than other sources of motive power. Mobile cranes, on the other hand, like those used on the railway lines and in civil engineering are often diesel-driven. Small mobile cranes are sometimes driven by petrol engines.

Overhead travelling cranes (span type), jib cranes (radius type) and mobile cranes are the main types of this piece of material-handling equipment.

Modern cranes are fitted with automatic safe-loading devices. The design.and operation of the cranes are steadily improving to meet the demands of industries. [5: 227]

1. What pieces of equipment have engineers developed for moving things about?
2. What purpose are cranes used for?
3. What loads are handled by power-driven cranes?
4. What does the design of a crane depend on?
5. What are the main sources of motive power for cranes?
6. What are the main types of cranes?

Text 7
Engines

The heat engine is a machine that converts heat energy to mechanical energy. The engines of motor-cars, motor-cycles, farm tractors, motor boats, etc. are heat engines, which belong to the subgroup of internal combustion engines. Combustion engines may be divided into several types according to the number of piston strokes. Most of modern automotive engines operate on four-stroke cycle. There are also engines which operate on two-stroke and six-stroke cycles.

A diesel engine is a machine which produces power by burning oil in a body of air which has been squeezed to a high pressure by a moving piston. Diesel engines are especially suitable where an independent source of power is required, as in ships, locomotives, mobile equipment of all sorts and isolated power plants.

Steam, gas and oil engines were known and used prior to the invention of the diesel engine. The steam engine converts the heat energy of steam to mechanical energy. A typical steam reciprocation engine consists of a cylinder fitted with a piston. A connecting rod and crankshaft change the piston to-and-fro motion into rotary motion. The steam pressure on the piston varies during the stroke, and it is a flywheel which maintains a constant output velocity. [5: 194]

1. What is a heat engine?
2. Into what types may combustion engines be divided?
3. What is a diesel engine?
4. Where are diesel engines especially suitable?
5. What parts does a typical engine consist of?
6. What subgroup of engines do heat engines belong to?

Text 8

Turbines

The turbine is a machine for generating mechanical power from the energy of the stream of fluid. Steam, hot air or gaseous products of combustion, and water are the most widely used working fluids.

A steam turbine may be defined as a form of heat engine in which the energy of the steam is transformed into kinetic energy. It consists of the following fundamental parts: a) a casing or shell containing stationary blades; b) a rotor, containing the moving blades; c) a set of bearings; d) a governor and valve system for regulating the speed and power of the turbine. The main types of steam turbines are axial-flow turbines and radial-stage turbines.

The reciprocating steam engine came into its own during the nineteenth century, when it found greatest use in mills, locomotives and pumping systems. The modern steam turbine, developed at the turn of the last century, is rapidly replacing the reciprocating engine for large installations. Gas is used as the working fluid in gas turbines. The basic theory underlying their design and their operating characteristics is identical with that for steam turbines. The energy of water is converted into mechanical energy of a rotating shaft in hydraulic turbines. Power may be developed from water by three fundamental processes: by action of its weight, of its pressure or of its velocity; or by a combination of any or all three. [5: 197]

1. What is the turbine?
2. What are the most widely used working fluids?
3. What is the steam turbine?
4. When did the reciprocating steam engine come into its own?
5. In what turbines is gas used as a working fluid?

Text 9
Boilers

A boiler is a closed vessel in which water, under pressure, is transformed into steam by the application of heat. Open vessels and those generating steam at atmospheric pressure are not considered to be boilers. The furnace converts the chemical energy in the fuel into heat. The function of the boiler is to transfer this heat to the water in the most efficient manner.

Progress in steam-boiler development has been rapid. The first boilers were very crude affairs, as contrasted with our present-day standards. The greatest number of contributions have been made in the last half century. The field of application is diversified. Boilers are used for heating, supplying steam for processes, furnishing steam to operate engines, etc.

Maintaining the correct boiler water level is the most important duty of the boiler operator. It is of the utmost importance that the manufacturer supply suitable and reliable devices for indicating the water level. Coal as well as liquid and gaseous fuels are used for boiler firing. The ideal boiler must be of correct design, sufficient steam and water space, and good water circulation. [5: 198]

1. Are vessels generating steam at atmospheric pressure boilers?
2. What are boilers used for?
3. What converts the chemical energy in the fuel into heat?
4. What is the most important duty of the boiler operator?
5. What must the ideal boiler be like?
6. How is water transformed into steam in a boiler?

Text 10
Components of the automobile

Automobiles are trackless, self-propelled vehicles for land transportation of people or goods, or for moving materials. There are three main types of automobiles. These are passenger cars, buses and lorries (trucks). The automobile consists of the following components: a) the engine; b) the framework; c) the mechanism that transmits the power-engine to the wheels; d) the body.

Passenger cars are, as a rule, propelled by an internal combustion engine. They are distinguished by the horse-power of the engine, the number of cylinders on the engine and the type of the body, the type of transmission, wheelbase, weight and overall length.

There are engines of various designs. They differ in the number of cylinders, their position, their operating cycle, valve mechanism, ignition and cooling system.

Most automobile engines have six or eight cylinders, although some four-, twelve-, and sixteen-cylinder engines are used. The activities that take place in the engine cylinder can be divided into four stages which are called strokes. The four strokes are: intake, compression, power and exhaust. "Stroke" refers to the piston movement. The upper limit of piston movement is called top dead centre, TDC. The lower limit of

piston movement is called bottom dead centre, BDC. A stroke constitutes piston movement from TDC to BDC or from BDC to TDC. In other words, the piston completes a stroke each time it changes the direction of motion. [5: 200]

1. What types of automobiles do you know?
2. How many cylinders have automobile engines?
3. What components does an automobile consist of?
4. What is a passenger car propelled with?
5. What is a stroke?

Text 11

Engine operation

An automobile, powered by a petrol engine, begins to operate when the driver turns a flywheel connected to the engine crankshaft. As the crankshaft revolves, a mixture of fuel and air is drawn from a carburetor into the engine cylinders. The ignition system provides the electric sparks that ignite this mixture. The resultant explosions of the mixture turn the crankshaft, and the engine starts moving. By regulating the flow of the fuel and air with a throttle, the driver controls the rotational speed of the crankshaft.

Cooling, electrical ignition and lubrication systems are of great importance for the good performance of a car. The lights, radio and heater add to the flexibility, comfort, and convenience of the car. The indicating devices keep the driver informed as to engine temperature, oil pressure, amount of fuel, and battery charging rate.

Brakes are of drum and disk types. The steering system consists of a manually operated steering wheel which is connected by a steering column to the steering gear from which linkages run to the front wheels. It is difficult to turn the steering wheel, and special hydraulic power mechanisms are used to lessen this effort. Suitable springings are used against shocks. These are leaf springs, coil springs, torsion bars and air suspensions. [5: 202]

1. When does an automobile begin to operate?
2. What ignites the mixture of fuel and air?
3. What do the resultant explosions of the mixture do?
4. How does the driver control the rotational speed of the crankshaft?
5. What types of brakes do you know?

Text 12

Diesel engines

The oil engine (diesel engine) is also a form of internal combustion engine. It has the usual arrangement of cylinder, piston, connecting rod, crank, inlet and exhaust valves as we find in petrol engine. In place of carburetor and sparking plug it has an injection pump and a fuel injection valve (injector). Unlike spark-ignition engines it uses the heat of compression to fire the fuel and is, therefore, called compression-ignition engine.

It utilizes a fuel known as diesel oil, which is forced in the form of a fine spray through a suitable nozzle directly into the combustion space. No mixture of fuel and air is introduced into the cylinder, the compression-ignition (CI) engine draws in pure air only. This air is then compressed by the ascending piston to a high pressure. As a result of it the temperature of the air is raised considerably so that the fuel oil injected into the cylinder ignites rapidly. Thereafter the gaseous products expand providing the energy for the power stroke.

The high-output oil engines are nearly all of two-stroke type. The charge is filled into the cylinder by means of a blower which assists both the intake and exhaust processes. One cycle completed within one revolution, i. e. in two strokes — compression and expansion.

Air-cooled engines

All vehicle engines are air-cooled to some degree. Even in water-cooled engines heat is transmitted first from cylinder to water and afterwards, in the radiator, from water to air. This method of cooling is not difficult to accomplish, because the heat taken off the hot cylinder walls by water can be distributed without difficulty upon the large cooling surface of the radiator, and so easy transmission of heat to air is made possible.

Reciprocating engines used in aircraft are almost entirely air-cooled. Aircraft engines cooled by air are manufactured today in sizes ranging from 50 to 3500 hp and they superseded water-cooled engines. The principal advantages of air-cooled aircraft engines are low weight, and greater reliability in operation. Modern motor-cycles are also designed almost exclusively with air-cooled engines.

New designs of air-cooled vehicle engines are notable for their easy maintenance, reliability and economical operation. [5: 204]

1. Why is the diesel engine called compression-ignition engine?
2. Does the compression-ignition engine use mixture of fuel and air?
3. What type are the high-output oil engines?
4. In what sizes are aircraft air-cooled engines manufactured today?
5. What is the peculiarity of new designs of air-cooled engines?

Text 13

The integrated circuit

The integrated circuit (IC) was developed in 1958 by Jack S. Kilby, an American electrical engineer. The IC is called so because all of its circuit elements are bonded together rather than separately wired to each other after being manufactured. Invented about 50 years ago, the IC has already become one of the marvels of the electronic industry, and it is being widely used in dozens of industries and consumer products.

An IC looks like a tiny silver grey square or chip of metal, perhaps one-half a centimeter on a side, and not much thicker than a sheet of paper. Yet, this useless looking chip represents the most highly skilled technology at every step of its

manufacture. At today's level of development it might consist of 10,000 separate electronic elements. It replaces many separate circuits, each of which, until recently formed a network of interlaced wires, resistors and capacitors, shielded coils and vacuum tubes, all hand-soldered into place.

Experts now predict that the IC has brought in an era of change so fundamental and widespread that it already has the characteristics of a second industrial revolution.

The range of uses of this electronic device is almost limitless. It has influenced nearly every human activity. [4:346]

1. How long has the IC been in use?
2. What does the integrated circuit look like?
3. How large is it?
4. How has the IC influenced the development of the computer?
5. What predictions do the experts make about the influence of the IC on the future development in industry?

Text 14
Computers: the software and the hardware

Because of extraordinary technological development during the past decades, the term 'computer' is becoming a household word. Computer applications have expanded to such breadth that the computer is now an integral part of virtually every type of business and industrial enterprise.

The number of electronic computers used in any given field of human activity is sometimes believed to indicate the degree of its modernity. For example, the more computers scientific institute uses the more modern it is believed to be. It is not always born in mind, however, that computers alone represent only what is called the hardware, i. e. the machinery together with its subtle technical and logical design. In order that the hardware may be used effectively, another essential factor is needed: the so-called software or applied thoughts. The preparation of computer programs, the working out of the logical aspects of material to be manipulated in a computer, takes up as much, if not more, time as the actual production of the hardware and is by no mean easier. The software, as most intangible product, is not always capable of being readily evaluated. This, however, does not change the fact that it is at least as decisive as the hardware in obtaining solutions to concrete scientific and technological problems.

There are two basic types of electronic computers: digital and analogue. Each type has its uses in various fields. However, they have one thing in common: for their effective operation they require ingeniously thought-out software. [1: 231]

1. Why is the term 'computer' becoming a household word?
2. What do computers alone represent?
3. What is needed in order that the hardware may be used effectively?
4. How much time does the preparation of computer programs take?
5. What do digital and analogue computers have in common?

Text 15

Science and technology

Science has great influence on our lives. It provides the basis of modern technology — the tools and machines that make our life and work easier. The discoveries and inventions of scientists also help shape our view about ourselves and our place in the universe.

Technology means the use of people's inventions and discoveries to satisfy their needs. Since people have appeared on the earth, they have had to get food, clothes, and shelter. Through the ages, people have invented tools, machines, and materials to make work easier.

Nowadays, when people speak of technology, they generally mean industrial technology. Industrial technology began about 200 years ago with the development of the steam engine, the growth of factories, and the mass production of goods. It influenced different aspects of people's lives. The development of the car influenced where people lived and worked. Radio and television changed their leisure time. The telephone revolutionized communication.

Science has contributed much to modern technology. Science attempts to explain how and why things happen. Technology makes things happen. But not all technology is based on science. For example, people had made different objects from iron for centuries before they learnt the structure of the metal. But some modern technologies, such as nuclear power production and space travel, depend heavily on science. [2: 149]

1 What is the basis of modern technology?
2. What have people invented to make work easier?
3. What did industrial technology begin with?
4. What has science contributed to?
5. Is all technology based on science? Give an example.

Перелік рекомендованої літератури

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