

**МИНИСТЕРСТВО ОБРАЗОВАНИЯ И НАУКИ
РОССИЙСКОЙ ФЕДЕРАЦИИ**

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A BOOK OF SCIENCE AND COMPUTERS

Методические указания и учебные задания
по профессионально-ориентированному чтению
для студентов 2 курса технических специальностей



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Учебные задания составлены на основе аутентичных материалов профессиональных английских и американских изданий и Интернет-ресурсов и предназначены для студентов 2 курса 1-5 и 7 факультетов технических специальностей.

Цель пособия – научить чтению и пониманию оригинальной литературы, способствовать формированию лингвистических навыков в данной отрасли знаний.

Подготовлены кафедрой иностранных языков и рекомендованы к изданию редакционно-издательским центром Санкт-Петербургского государственного университета аэрокосмического приборостроения.

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MODULE I. SCIENCE AND TECHNOLOGY

UNIT 1

Lesson 1. The progress of science in the 20th century

I. Read and memorize the following words and word combinations:

development – развитие, разработка

invention – изобретение

discovery – открытие

human being - человек

satellite – космический спутник

to solve – решать

to calculate – вычислять, подсчитывать

to set free – высвободить

II. Practise reading the following international words. Consult the dictionary if necessary.

Arctic, airplane, present, automatically, machine, medicine, giant, to duplicate, civilization, atom, process, energy.

III. Read and translate the text.

There have been great changes in the life surroundings and the conditions of human beings during the past century. Less than a hundred years ago many of the things that we do now were thought to be impossible. For example, flying and other things, like listening to music from thousands of miles away in the radio, would certainly have been thought impossible if people had ever imagined them. Radio and television are no longer just inventions that bring pleasure and amusement to our homes. By means of radio and television we can do an endless number of jobs: call doctors to far-off places in the Arctic, help airplanes to land automatically in bad weather, direct the work of a dozen machines at once, or guide the flight of rockets and sputniks in space.

Among the most important scientific discoveries are new medicines. Several serious illnesses, from which 50 years ago people used to die, can be cured quite easily. It is true that some of the serious illnesses still can't be cured but it will not be long before scientists succeed in finding means to do away with them.

One of the wonders of our age is the "electronic brain", or the giant calculating machine, which can to some extent duplicate human senses.

These machines can feel, touch, smell, hear and see. They can solve mathematical problems many times faster than a human mathematician and are widely used in our country for calculating the orbits of satellites and spaceships. With the help of an electronic calculation machine Russian scientists succeeded in reading the writings of the Mayas, the ancient civilization of Mexico.

Perhaps the most wonderful discovery of the twentieth century has been the splitting of the atom. The process of splitting the atom is called nuclear fission. When atoms split they set free a tremendous amount of energy. Men are learning to put this energy to use.

Notes

By means of – посредством; *to do away with* – покончить, положить конец; *to some extent* – в некоторой степени; *to split* – расщепить; *nuclear fission* – ядерное деление.

IV. Give the Russian equivalents.

Spaceship, invention, a mathematician, medicine, to split the atom, impossible, satellites, development, to duplicate, to succeed, endless.

V. Give the English equivalents.

Математические задачи, вычислительная машина, спутник, вычислять, эра, отдаленный, количество, автоматически, человек, достижение.

VI. Translate the words of the same root. State what parts of speech they are.

To change – a change; to surround – surroundings; to imagine – an image – imagination; possible – impossible; to invent – an invention – an inventor; to amuse – amusing – amusement; to end – an end – endless; to discover – a discovery; ill – illness; to succeed – success – successful – successfully.

VII. Answer the following questions.

1. What changes can we see in our life? 2. How are radio and television used now? 3. How can recent scientific discoveries help in medicine? 4. What is the “electronic brain”? 5. What can the “electronic brain” do? 6. What is the most wonderful discovery of the 20th century? 7. What do you consider to be the main scientific discovery of the 20th century? 8. Can you give any other example of new discoveries?

VIII. Give a brief summary of the above text.

Lesson 2. Science in our life

I. Read and memorize the following words and word combinations:

to increase – увеличивать

device – устройство, прибор

electric engineering – электротехника

radio engineering – радиотехника

to design – разрабатывать

artificial intellect – искусственный интеллект

branch – отрасль

to equip – оборудовать

launching – запуск

II. Practise reading the following words. Consult the dictionary if necessary.

Social, industrial, aspect, thermonuclear, radar, experiment, supercomputer, submarine, intellect, interplanetary.

III. Read and translate the text.

Today we see that science has great influence on social, industrial and political aspects of our life. The development of science has increased man's knowledge of nature. Modern experimental science began about 400 year ago. The man learned to use the energy of fire and water. Later, the man made steam serve him. Nowadays, the man uses thermonuclear energy. Not a day passes without the appearance of a new electronic device. The first great progress in electronics came with the invention of the vacuum tube or valve in 1904. It made broadcasting possible. The development of electronics during World War II gave us radars and electronic computers. The first general purpose computer for scientific use was invented in 1949. Today computers have become common. Computers can conduct experiments in places which are too dangerous for people. Some computers are used in caves and mines to replace workers. Besides they can be designed for special purposes. They can solve mathematical problems, make bank operations, and play chess. New supercomputers solve problems in many branches of industry, science and culture. They are widely used in submarine navigation and in modern medicine. Now much is being done to create artificial intellect. Science has brought into being new atomic technologies. Electric engineering and radio engineering have been created in the same way.

Science and technology have achieved great progress in space research. There have been space flights, the launching of interplanetary stations in the direction of Mars, radar contacts with the planets Mercury and Venus.

Science enters our homes. Many people have already forgotten what the world was like before television. Several generations of children have grown up with TV as a baby-sitter, a teacher and a companion. A lot of kitchens in our apartments are so well equipped that they look like a control room. We are so used to all these things that we can't imagine our life without science.

Notes

Thermonuclear energy – термоядерная энергия; *not a day passes without...* – ни дня не проходит без...; *a vacuum tube* – электронная лампа; *a general purpose computer* – универсальный компьютер, компьютер общего назначения; *to bring into being* – привести к появлению.

IV. Give the Russian equivalents.

Development, thermonuclear, appearance, invention, to conduct experiments, general purpose, artificial intellect, technology, launching, to equip, control room.

V. Give the English equivalents.

Проводить эксперименты, электронное устройство, телевидение, хорошо оборудованный, в направлении, решать задачи, отрасль промышленности, радиотехника, управление, исследование, электротехника, искусственный интеллект, развитие.

VI. Answer the following questions.

1. Why is science so important? 2. What kinds of energy can the man use? 3. When did the first computer appear? What was it like? 4. What kinds of computers are described in this text? What do you know about them? 5. How do computers help scientists? 6. What are the spheres of applications of computers in modern life? 7. How are computers used in space research? 8. Do children use computers nowadays? How?

VII. Prove that computers are widely used in modern life.

VIII. What is a general purpose computer? A special purpose computer? A supercomputer? What do you know about an analog computer? A digital computer? A hybrid computer?

Lesson 3. Science and technology nowadays

I. Read and memorize the following words and word combinations:

to overestimate – переоценивать

to apply – применять

ancestor – предок

trivial – тривиальный

combustion – сгорание

gravity – притяжение, сила тяжести

to embrace – охватывать

to arouse – пробуждать

to disclose – раскрыть

responsibility – ответственность

be grateful – быть благодарным

II. Read and translate the text.

It's difficult to overestimate the role of science and technology in our life. They accelerate the development of civilization and help us in our co-operation with nature. Scientists investigate the laws of the Universe, discover the secrets of nature, and apply their knowledge in practice improving the life of people.

Let's compare our life nowadays with the life of people at the beginning of the 20th century. It has changed beyond recognition. Our ancestors hadn't the slightest idea of the trivial things created by the scientific progress that we use in our every day life. They are refrigerators, TV sets, computers, microwave ovens, radio telephones... They would seem miracles to them that made our life easy, comfortable and pleasant.

On the other hand, the great inventions of the beginning of the 20th century such as radio, airplanes, combustion and jet engines, have become usual things and we can't imagine our life without them. A century is a long period for scientific and technological progress, as it's rather rapid. Millions of investigations, the endless number of outstanding discoveries have been made. The 20th century had several names that were connected with a certain era in science and technology. At first it was called the atomic age due to the discovery of the splitting of the atom.

Then it became the age of the conquest of space of when for the first time in the history of mankind a man overcame the gravity and entered the Universe. And now we live in the information era when the computer

network embraces the globe and connects not only the countries and space stations but a lot of people all over the world. All these things prove the power and the greatest progressive role of science in our life. But every medal has its reverse. And the rapid scientific progress has aroused a number of problems that are a matter of our great concern. These are ecological problems, the safety of nuclear power stations, the nuclear war threat, and the responsibility of a scientist. But still we are grateful to the outstanding men of the past and the present who have courage and patience to disclose the secrets of the Universe.

III. Give the Russian equivalents.

The development of civilization, a recognition, the slightest idea, to mean, an invention, jet engines, rapid, investigation, an outstanding discovery, the splitting of the atom, the conquest of space, the nuclear war threat, to disclose the secrets, a matter of our great concern.

IV. Give the English equivalents.

Реактивные двигатели, угроза ядерной войны, ускорять, сотрудничество, Вселенная, улучшать жизнь, двигатели внутреннего сгорания, реактивные двигатели, выдающиеся открытия, атомный век, человечество, эра, земной шар, обратная сторона медали, безопасность, быть благодарным, раскрыть тайны.

V. Answer the following questions.

1. What accelerates the development of civilization? 2. Who investigates the laws of the Universe, discover the secrets of nature? 3. What are trivial things that we use in our every day life? 4. What names did the 20th century have? 5. Why was the 20th century called the age the conquest of space? 6. We live in the information era of the computer network, don't we? 7. What problems have been aroused with the rapid scientific progress?

VI. Discuss the following.

1. The role of modern technologies in the development of our society.
2. The great inventions of the beginning of the 20th century.
3. Our century is called the atomic age.
4. Our century is the age of the conquest of space.
5. Our century is the age of information.

Lesson 4. Scientific research

1. Read and memorize the following words and word combinations:

substantial – существенный, заметный

exploration – исследование

laypeople – дилетанты

to apply – применять, прилагать

solitary – уединённый

representative – представитель

participation – участие

to consume – потреблять

goal – цель

attribute – признак

to foster – способствовать

to involve – вовлекать, включать в себя

to employ – применять, использовать

II. Read and translate the text.

Scientific research requires substantial funding, especially when it involves the use of expensive equipment. This funding often comes directly from governments. In the U.S., for example, it is the federal government that sponsors most national defense and space exploration projects.

Funding for science can also come from science foundations. In 1950, the U.S. Congress passed an act that established the National Science Foundation¹. This independent federal agency develops a national science policy and supports scientific research and education. Two other well-known foundations that are involved in disease research are the American Cancer Society² and the National Heart Association.

Research is also conducted and supported by private-sector industries that employ scientists — especially from the applied sciences — who work at the development of industrial or commercial processes and products. Scientific research is also supported by universities through professorships. Most professors do not just give classes but also conduct scientific research. Indeed, what many professors are looking for is the opportunity to work at a university where they can continue their own research. These are the professors whose students have the chance to observe real research at firsthand. Most universities specialize in certain fields and they are frequently judged on the achievements of their research professors. Scientists whose research findings are published and talked about in scientific circles bring prestige to the institution where they work.

Laypeople often think of R&D (research and development) scientists as solitary figures working in a laboratory on some abstract problem. Though this may be true for a handful of scientists working on basic research, the vast majority work on R&D projects in teams. These project teams include not only scientists from various disciplines but also representatives from diverse functional groups within a company, for example, marketing, manufacturing, and human resources.

Formerly, R&D projects were passed from one group of specialists to another in serial fashion. The term “throwing it over the wall” was often used to describe this way of working, in which each stage of the process was isolated from the others. Research evidence showed that this method was neither efficient nor cost-effective because it was very time-consuming.

Companies now bring together representatives from each stage of the process and, in this way, they try to achieve more cross-functional communication and participation. The goal is to coordinate processes better and to identify and avoid problems that otherwise might only be covered later. In order to work effectively in cross-functional project teams, scientists must have up-to-date knowledge of their technical fields and also skills in communication, problem-solving, and group decision-making — all necessary for successful teamwork. As a result, universities are now giving more importance to the development of these skills, and companies are looking for ways to foster these attributes in training programs for their employees.

Notes

¹The National Science Foundation (NSF) is a United States government agency that supports fundamental research and education in all the non-medical fields of science and engineering. Its medical counterpart is the National Institutes of Health. With an annual budget of about \$6.02 billion (fiscal year 2008), NSF funds approximately 20 percent of all federally supported basic research conducted by the United States’ colleges and universities. In some fields, such as mathematics, computer science, economics and the social sciences, NSF is the major source of federal backing.

²American Cancer Society (ACS) is the nationwide community-based voluntary health organization dedicated to eliminating cancer as a major health problem by preventing cancer, saving lives, and diminishing suffering from cancer, through research, education, advocacy and service.

III. Give the Russian equivalents.

Scientific research, expensive equipment, exploration projects, a

national science policy, disease research, professorships, at firsthand, solitary figures, a handful of scientists, research evidence, time-consuming, up-to-date knowledge, to foster.

V. Give the English equivalents.

Существенное финансирование, научные фонды, проводить научное исследование, исследование болезни, искать возможность, специализироваться в определенных областях, научные круги, горстка ученых, участие, техническая область, решение проблем, программы обучения.

VI. Translate the words of the same root. Define speech parts.

Science – scientific – scientifically – a scientist; to explore – an explorer – an exploration – explorative; to develop – a developer – development – developing – developed; to specialize – special – a specialist – a specialty; an achievement – to achieve – achievable; manufacturing – to manufacture – a manufacturer; a representative – to represent – representative – representation; to employ – an employer – an employee – employment – the (un)employed; commerce – commercial.

VII. Answer the following questions.

1. What are the financing sources of scientific research? 2. What is the role of science foundations? 3. Research is not supported by private-sector industries, is it? 4. How do the professors conduct and support scientific research? 5. What do laypeople often think of R&D scientists? 6. What is the role of project teams? Why do they include scientists? 7. How do companies achieve more cross-functional communication and participation in research?

UNIT 2

Lesson 1. Electronics as a science

I. Read the text for gist and retell it briefly.

Electronics as a science studies the properties of electrons, the laws of their motion, and the laws of transformation of various kinds of energy.

Electronics is a science, which deals with devices and instruments that are operated by the control of the movement of electric charges in a vacuum, in gasses, or in semiconductors; or with the processing of information or the control of energy by such devices. This definition covers the whole complex family of vacuum and gaseous electron tubes and their

application. It also includes semiconductor and transistor technologies to process information or to convert energy. Without electronics we would not have cybernetics, cosmonautics and nuclear physics. It is no mistake to compare the birth of electronics to such great achievements of mankind as the discovery of fire, and penetration into the secrets of the atom. Shortly speaking, electronics is not so much a new subject; it is rather a new way of looking at electricity.

II. Read and translate the text.

Overview of electronic engineering

Electronic engineering involves the design and testing of electronic circuits that use the electronic properties of such components as resistors, capacitors, inductors, diodes and transistors to achieve a particular functionality.

Signal processing deals with the analysis and manipulation of signals. Signals can be either analog, in which case the signal varies continuously according to the information, or digital, in which case the signal varies according to a series of discrete values representing the information.

For analog signals, signal processing may involve the amplification and filtering of audio signals for audio equipment or the modulation and demodulation of signals for telecommunications. For digital signals, signal processing may involve the compression, error checking and error detection of digital signals.

Control engineering has a wide range of applications from the flight and propulsion systems of commercial airplanes to the cruise control found in many modern cars. It also plays an important role in industrial automation.

Control engineers often utilize feedback when designing control systems. For example, in a car with cruise control the vehicle's speed is continuously monitored and fed back to the system which adjusts the engine's power output accordingly. Where there is regular feedback, control theory can be used to determine how the system responds to such feedback.

III. Find international terms and practice their pronunciation.

IV. Look through the text again and choose phrases or sentences with the most relevant information.

V. Read the text and ask 3 or 4 questions of different types in writing.

Microelectronics

Microelectronics is a subfield of electronics which is related to the study and manufacture of electronic components which are very small. These devices are made from semiconductors using a process known as photolithography. Many components of normal electronic design are available in microelectronic equivalents: transistors, capacitors, inductors, resistors, diodes and of course insulators and conductors can all be found in microelectronic devices.

Digital integrated circuits consist mostly of transistors. Analog circuits commonly contain resistors and capacitors as well. Inductors are used in some high frequency analog circuits; they occupy a large chip area if used at low frequencies.

As techniques improve, the sizes of microelectronic components continue to decrease. At smaller scales, the effects of minor circuit elements such as interconnections may become more important. These are called parasitic effects, and the goal of the microelectronics design engineer is to find ways to compensate for or to minimize these effects.

Notes

Parasitic effects - паразитные явления (побочные, нежелательные явления, возникающие в схеме)

Lesson 2. What does solid-state mean in relation to electronics?

I. Read and memorize the following words and word combinations:

dashboard – приборная панель

pointer – стрелка, указка

camcorder – видеокамера

amplifier – усилитель

flow – поток

alternating current (AC) – переменный ток

direct current (DC) – постоянный ток

incandescent bulb – лампа накаливания

fiber-optic – оптоволоконный

space probe – автоматическая межпланетная станция

reliable – надежный, достоверный

efficient – эффективный

steering – управление; *a steering wheel* – руль

relative to – относящийся (к)

II. Read and translate the text.

Solid-state **electronic** devices are part of our everyday lives. Solid-state miniature electronic components are in many places: the beeping sound made by a cell phone; auto dashboard alarm; the voice chip in an answering machine; **TV remote control**; laser pointer; the inside of an **MP3 player**; a **quartz watch**; the image sensor in a **digital camera** and a **camcorder**; the computer **monitor**, etc.

The transistor, invented in 1947 by Bell Labs, was the first solid-state device to come into commercial use in the 1960s. Solid-state electronic devices have replaced vacuum tubes in just about all electronics devices. Vacuum tubes are still used in the transmitters of radio stations you listen to, many guitar amplifiers and some audiophile equipment. Vacuum tubes are the opposite of “solid-state” because tubes burnout, break, etc.

Solid-state gets its name from the path that electrical signals take through solid pieces of semi-conductor material. Prior to the use of solid-state devices, such as the common transistor, electricity passed through the various elements inside of a heated vacuum tube. Solid-state devices, such as a transistor, use conductors to control the flow of signals through a circuit.

Solid state devices called diodes have replaced rectifier vacuum tubes, used to transform AC to DC. Cool-running light-emitting diodes (LEDs), another solid-state device used for indicators on the front panel of your computer and monitor, have replaced the earlier incandescent bulbs. Multiple bright LEDs are also used for the third stoplight on many vehicles and for **traffic signals**.

Electrical engineers design computers and incorporate them into devices and systems. They design two-way communications systems such as telephones and fiber-optic systems, and one-way communications systems such as radio and television, including satellite systems. They design control systems, such as aircraft collision-avoidance systems, and a variety of systems used in medical electronics. Electrical engineers are involved with generation, control, and delivery of electric power to homes, offices, and industry. Electric power lights, heats, and cools working and living space and operates many devices used in homes and offices. Electrical engineers analyze and interpret computer-aided tomography data (CAT scans), seismic data from earthquakes and well drilling, and data from space probes, voice synthesizers, and handwriting recognition. They

design systems that educate and entertain, such as computers and computer networks, compact-disk players, and multimedia systems.

The integration of communications equipment, control systems, computers, and other devices and processes into reliable, easily understood, and practical systems is a major challenge, which has given rise to the discipline of systems engineering. Electrical engineering must respond to numerous demands, including those for more efficient and effective lights and motors; better communications; faster and more reliable transfer of funds, orders, and inventory information in the business world; and the need of medical professionals for access to medical data and advice from all parts of the world.

Notes

A replaced rectifier vacuum tube – заменяемая диодная вакуумная трубка; *a cool-running light-emitting diode* – холодный светоиспускающий диод; *an aircraft collision-avoidance system* – система предотвращения авиационных столкновений.

III. Give the Russian equivalents.

Everyday lives, inventory, information, efficient and effective lights and motors, cell phone, solid-state device, semi-conductor material, heated vacuum tube, [traffic signals](#), two-way communications systems, aircraft collision-avoidance systems, analyze and interpret, earthquake, electrical engineering.

IV. Give the English equivalents.

Полупроводниковое электронное устройство, автоответчик, датчик изображения, коммерческое использование, радиопередатчик, лампа накаливания, множество, рабочее и жилое пространство, космическая станция, распознавание рукописных текстов.

V. Complete the sentences.

1. Solid-state electronic devices have ____ in just about all electronic devices. 2. Solid-state devices, such as a transistor, use ____ 3. Solid state devices called diodes have ____ 4. Electrical engineers design ____ 5. They design systems that educate and entertain, such as ____ 6. Electrical engineers analyze and interpret ____.

VI. Is it true or false?

1. Such common things as **TV remote control**, laser pointer or **quartz watch** contain solid-state miniature electronic components.
2. The first solid-state device was invented in the 1960s.
3. Vacuum tubes were replaced by solid-state electronic devices, but are still used in the transmitters of radio stations you listen to, many guitar amplifiers and some audiophile equipment.
4. Incandescent bulbs are used for indicators on the front panel of your computer and monitor.
5. Electrical engineers construct and analyse computers, control systems, telephones and fiber-optic systems, and one-way communications systems such as radio and television, including satellite systems.

VII. Answer the following questions.

1. What are solid-state electronic devices?
2. Where are solid-state miniature electronic devices used?
3. Who invented the transistor?
4. Why are solid-state devices better than vacuum tubes?
5. How light-emitting diodes may be used?
6. What do electrical engineers design?
7. Where is electric power used?

VIII. Say what you've learned from the text about:

- a) the history of transistors;
- b) the work of vacuum tubes;
- c) the principles of electrical engineering.

UNIT 3

Lesson 1. Science and computer technologies

I. Read and memorize the following words and word combinations:

rate – темп, скорость

well-being – благосостояние

field – область

in recent years – в течение последних лет

to achieve – достигать

astounding – изумительный

weapons – оружие

disaster – бедствие

take into consideration – принять во внимание

outstanding – выдающийся
thanks to – благодаря
achievements – достижения
atom fission – расщепление атома
to injure – повредить
to investigate – исследовать
in this respect - в этом отношении
to influence – влиять
to warn – предупреждать

II. Read and translate the text.

Is it that does us good or does it bring disaster?

Science is a source of progress. It develops the world we live in. Our century is an epoch of great discoveries in science and engineering. It is an epoch of scientific and technological revolution discoveries, when new ideas are being born and new discoveries, inventions are being made at an ever increasing rate.

Today science has become the most important factor in the development of national economy in the whole world. Scientific progress serves the interests of society, helps to increase the well-being of people and develops public education.

Computer technology plays the most important role in the progress of science. The ability of computers to solve many mathematical problems more effectively than man does, has given rise to new trends in mathematics. Computer science is a new field of study and research. In recent years scientists of the world have achieved great success in the development of physics, chemistry, biology, and such astonishing, interesting science as psychology. But science may be turned both for peace and military purpose. It can take good forms and evil forms. With the help of scientific inventions politicians make weapons of mass destruction. But on the other hand researches help us in our life: at home, at work, at school and make the level of the country development higher. That's why there are a lot of facts telling about a great amount of well-known scientists who had burned their works when they've understood the consequences of their inventions.

To answer the question whether science does us good or does it bring disaster isn't a simple task. We should take into consideration many facts. On the one hand a lot of outstanding discoveries made the life of the people more comfortable and pleasant. Without scientific discoveries and

inventions no progress would be possible. Thanks to discovery of electricity we can listen to the radio, watch TV, see films, people learned how to produce steel and metal alloys — now we use railways and airplanes. Development of chemistry led to new synthetic fibers and people got more clothing and food. People learned to use scientific achievements in curing incurable earlier diseases. But on the other hand such outstanding discoveries of the 20th century as atom fission led to creation of the weapons of mass destruction. We should say that science has a potential for both good and evil. Alfred Nobel invented a new explosive (dynamite) to improve the peacetime industries of road building, but saw it used as a weapon of war to kill and injure his fellow men. He was born in Stockholm on October 21st 1833, but moved to Russia with his parents in 1842. Most of the family returned to Sweden in 1859, where Alfred began his own study of explosives in his father's laboratory. He had never been to school or university, but had studied privately and by the time he was 20 was a skillful chemist and an excellent linguist, speaking Russian, English, German, French and Swedish. He was very imaginative and inventive. His greatest wish, however, was to see an end to wars, and thus between nations, and he spent much time and money working for this cause, until his death in 1896. His famous will in which he left money to provide prizes for outstanding discoveries in Physics, Chemistry, Physiology, Medicine, Literature and Peace, is a memorial to his interests and ideals. Medical men use laser to cure and investigate diseases and at the same time laser can be used for destruction. Achievements of biology and chemistry are also used to cause damage to people. All this shows that science can take good forms and evil forms. What form does it take depends on the way people work with science. It is impossible to stop progress, to stop people to investigate and explore the world. But people should care it wouldn't be led in wrong direction. Scientists need you thinking in a new much broader way than before. In this respect the education and cultural level are of great importance. They have to influence politicians, warn them of possible effects of using new discoveries. Scientists and politicians think that it's their responsibility for not using scientific developments to cause damage and destruction. There is a lot of work to be done in this direction.

III. Give the Russian equivalents.

Source of progress, an epoch of great discoveries, technological revolution discoveries, to cause damage and destruction, in a new much broader way than before, led in wrong direction, the peacetime industries

of road building, a skillful chemist and an excellent linguist, to increase the well-being of people and develop public education, increasing rate.

IV. Find in the text the English equivalents for the following Russian words and phrases.

Компьютерные технологии, играть важную роль, оружие массового уничтожения, выдающийся ученый и политик, мирное время, решать многие математические задачи, в течение последних лет, развитие и научные достижения, открытия, изобретения в области химии, невозможно остановить прогресс.

V. Complete the following sentences using the appropriate word from the box.

<i>Outstanding, influence, investigate, creation, discovery, achievements, invention, scientific</i>
--

1. It's a particular branch of ____ knowledge.
2. He's an English chemist whose work on radioactive disintegration led to the ____ of isotopes.
3. This is a document granting an inventor sole rights to a ____.
4. There is an annual award for ____ contributions to chemistry or physics or psychology or medicine or literature or peace.
5. ____ of biology and chemistry are also used to cause damage to people.
6. Outstanding discoveries of the 20th century such as atom fission led to ____ of the weapons of mass destruction.
7. The motion of charged particles in a colloid under the ____ of an electric field; particles with a positive charge go to the cathode and negative ones to the anode.
8. It deals with the rational ____ of questions about existence and knowledge and ethics.

VI. Answer the following questions.

1. Can you describe our century from the standpoint of scientific progress?
2. What is the role of computer technology in the progress of science?
3. Why did a great amount of well-known scientists burn their works?
4. Outstanding discoveries can take good forms and evil forms. Prove it.
5. What was Alfred Nobel's famous will about?
6. What should

scientists care for investigating and exploring the world?

VII. Express your opinion on the problem discussed in the text.

MODULE II. COMPUTER ESSENTIALS

UNIT 1. COMPUTER AS IT IS

Lesson 1. Computers

I. Read and memorize the following words and combinations:

physical quantities – физические величины

device – прибор, устройство, механизм

to measure – измерять

numerical value – численное значение

incredible – невероятный, немыслимый

ability – способность

to add – прибавлять, складывать

to subtract – вычитать

to multiply – умножать

to divide – делить

human brain – человеческий мозг

solution – решение

circuit – электронная схема, микросхема

to clock – заводить, запускать

II. Read and translate the text.

There are two types of computers, the analogue and the digital. Basically, today's analogue computer is a device for measuring such physical quantities as lengths and voltages and, through a mechanical linkage, exhibiting the measurement as a numerical value. However, the analogue computer is limited to special classes of problems and when most people say "computer" today, they mean the digital computer which is a marvel of precision and accuracy, for it works with specific units rather than approximations.

The modern electronic digital computer counts with incredible speed using only two numbers — the one and zero what mathematicians call the binary system. The counting ability of the computer is used to feed it information. But first the information is translated into a code.

The information is then stored in a memory bank made of magnets. The direction in which electrical signals run through the magnets means one or zero, yes or no, off or on. Each magnet contains one piece of information called a bit. A large computer system can store hundreds of millions of such information bits.

But information by itself is useless. The computer must be told what to do with it — to add, subtract, multiply, or divide the coded pulses stored in its memory. Parts of that memory contain instructions, prepared by a human brain, that provide the computer with the road to follow in order to solve a problem. These instructions are called the program.

What makes the computer different from an adding machine is that the computer can modify its instructions.

If a problem cannot be solved by following one route, the computer can search its memory for another set of instructions until a solution is found. And it does all this at superhuman speeds. The on-off switching of the computer's logic circuits has been clocked at a billionth of a second. That is to one second what one second is to thirty years.

But the computer cannot actually think. It performs all of its functions by route. Once an answer is achieved, another program within the memory tells the computer how to display the solution, to type it out on paper, display it as pictures or words on a television screen, or perhaps even to speak the answer in words a man can hear.

Notes

A marvel of precision and accuracy – чудо четкости и точности. It performs all of its functions by route. – Он выполняет все свои функции по программе.

III. Give the Russian equivalents.

Analog computer is a device for measuring physical quantities, to count with incredible speed, the counting ability, a piece of information called a bit, information by itself is useless, superhuman speeds, the computer cannot actually think.

IV. Give the English equivalents.

Физические величины, численное значение, чудо четкости и точности, двоичная система, сотни миллионов бит информации; складывать, вычитать, умножать или делить; инструкции, подготовленные человеческим мозгом; включение и выключение компьютерных схем.

V. Fill in the blanks.

1. In fact the analogue computer /ограничен/ to special classes of problems. 2. The counting ability of the computer /используется/ to feed it information. 3. First the information /переводится/ into a code. 4. The information /хранится/ in a memory bank made of magnets. 5. The computer /нужно сказать/ what to do with information. 6. These instructions /называются/ the program. 7. If a problem /не может быть решена/ by following one route, the computer can search its memory for another set of instructions. 8. Once an answer /получен/, another program tells the computer how to display the solution.

VI. Answer the following questions.

1. What are the two types of computers? 2. What is today's analog computer? 3. What device do most people mean when they say "computer"? 4. How many numbers does the so-called binary system use? 5. Where is information stored inside a computer? 6. What do we call a magnet containing one piece of information? 7. How many information bits can a large computer system store? 8. What does the computer use its counting ability for? 9. Is information useful by itself? 10. Who prepares instructions for the computer? 11. What is program? What makes the computer different from the adding machine? 12. Explain the word combination "superhuman speed". 13. What is the difference between the computer and the human brain?

VII. Give a brief summary of the text.

VIII. Read the text and translate it without a dictionary. Write a short summary of it.

What a computer is

The term "computer" is used to describe a device made up of a combination of electronic and electromechanical (i.e. electronic and mechanical) components. Computer has no intelligence by itself and is referred to as hardware.

A computer system is a combination of five elements:

- Hardware
- Software
- People
- Procedures
- Data/information

When one computer system is set up to communicate with another computer system, connectivity becomes the sixth system element. In other words, the manner in which the various individual systems are connected — for example, by phone lines, microwave transmission, or satellite — is an element of the total computer system.

Software is the term used to describe the instructions that tell the hardware how to perform a task. Without software instructions, the hardware doesn't know what to do. People, however, are the most important component of the computer system: they create the computer software instructions and respond to the procedures that those instructions present.

The basic job of the computer is the processing of information. Computers accept information in the form of instructions called a program and characters called data to perform mathematical and logical operations, and then give the results. The data is raw material while information is organized, processed, refined and useful for decision making. Computer is used to convert data into information and to store information in the digital form.

Notes

Connectivity – связь, согласованность; *raw material(s)* – сырье

Lesson 2. How computer works

I. Read the title and guess the main idea of the text.

II. Read the first sentence of every paragraph and guess the ideas it covers. Begin with the 3d one.

III. Read and translate the whole text.

A computer is an electronic machine which can accept data in a certain form, process the data and give the results of the processing in a specified format as information.

First, data is fed into the computer's memory. Then when the program is run, the computer performs a set of instructions and processes the data. Finally, we can see the results (the output) on the screen or in printed form.

A computer system consists of two parts: hardware and software. Hardware is any electronic or mechanical part you can see or touch.

Software is a set of instructions, called a program, which tells the computer what to do.

A general purpose computer has four main sections: the arithmetic and logic unit (ALU), the control unit, the memory, and the input and output devices (collectively termed I/O). These parts are interconnected by busses, often made of groups of wires.

The control unit, ALU, registers, and basic I/O (and often other hardware closely linked with these) are collectively known as a central processing unit (CPU).

CPU is perhaps the most influential component. It has two functions: (1) it obtains instructions from the memory and interprets them and (2) it performs the actual operations. The first function is executed by the control unit which in its turn also performs two functions. It (1) interprets the instruction and, on the basis of this interpretation, (2) tells the ALU what to do next.

Early CPUs were composed of many separate components but since the mid-1970s CPUs have typically been constructed on a single integrated circuit called a microprocessor.

ALU. ALU performs the actual operations through the use of electronic signals. This unit is capable of performing automatically addition, subtraction, multiplication, division, comparing, selecting, and other mathematical and logical operations. What happens in the ALU while an instruction is being executed? In most computers only one word at a time can be transferred between the ALU and the memory. Hence, to perform an operation involving two arguments, the first argument must be transferred from the memory to the ALU and stored there temporally while the second argument is being transferred. The special memory cell in the ALU for this purpose is called the accumulator. The operation being performed, the result is formed in the accumulator before it is transmitted back to memory.

Control unit. The control unit (often called a control system or central controller) directs the various components of a computer. It reads and interprets (decodes) instructions in the program one by one. The control system decodes each instruction and turns it into a series of control signals that operate the other parts of the computer. Control systems in advanced computers may change the order of some instructions so as to improve performance. A key component common to all CPUs is the program counter, a special memory cell (a register) that keeps track of which location in memory the next instruction is to be read from. The control system's function is as follows — (note that this

is a simplified description, and some of these steps may be performed concurrently or in a different order depending on the type of CPU).

- 1) To read the code for the next instruction from the cell indicated by the program counter.

- 2) To decode the numerical code for the instruction into a set of commands or signals for each of the other systems.

- 3) To increment the program counter so that it points to the next instruction.

- 4) To read whatever data the instruction requires from cells in memory (or perhaps from an input device). The location of this required data is typically stored within the instruction code.

- 5) To provide the necessary data to an ALU or register. If the instruction requires an ALU or specialized hardware to complete, instruct the hardware to perform the requested operation.

- 6) To write the result from the ALU back to a memory location or to a register or perhaps an output device.

Since the program counter is (conceptually) just another set of memory cells, it can be changed by calculations done in the ALU. Adding 100 to the program counter would cause the next instruction to be read from a place 100 locations further down the program. Instructions that modify the program counter are often known as “jumps” and allow for loops (instructions that are repeated by the computer) and often conditional instruction execution (both examples of control flow).

It is noticeable that the sequence of operations that the control unit goes through to process an instruction is in itself like a short computer program — and indeed, in some more complex CPU designs, there is another yet smaller computer called a micro sequencer that runs a microcode program that causes all of these events to happen.

Multitasking. While a computer may be viewed as running one gigantic program stored in its main memory, in some systems it is necessary to run several programs simultaneously. This is achieved by having the computer switch rapidly between running each program in turn. One means by which this is done is with a special signal called an interrupt which can periodically cause the computer to stop executing instructions where it was and do something else instead. By remembering where it was executing prior to the interrupt, the computer can return to that task later. If several programs are running “at the same time”, then the interrupt generator might cause several hundred interrupts per second, switching a program each time. Since modern computers typically execute instructions several orders of magnitude

faster than human perception, it may appear that many programs are running at the same time even though only one is executing in any given instant. This method of multitasking is sometimes termed “time-sharing” since each program is allocated a “slice” of time in turn. Before the era of cheap computers, the principle use for multitasking was to allow many people to share the same computer. Seemingly, multitasking would cause a computer that is switching between several programs to run more slowly — in direct proportion to the number of programs it is running. However, most programs spend much of their time waiting for slow input/output devices to complete their tasks. If a program is waiting for the user to click on the mouse or press a key on the keyboard, then it will not take a “time slice” until the event it is waiting for has occurred. This frees up time for other programs to execute so that many programs may be run at the same time without unacceptable speed loss.

Multiprocessing. Some computers may divide their work between one or more separate CPUs, creating a multiprocessing configuration. Traditionally, this technique was utilized only in large and powerful computers such as supercomputers, mainframe computers and servers. However, multiprocessor and multi-core (multiple CPUs on a single integrated circuit) personal and laptop computers have become widely available and are seeing increased usage in lower-end markets as a result.

Supercomputers in particular often have unique architectures that differ significantly from the basic stored-program architecture and from general purpose computers. They often feature thousands of CPUs, customized high-speed interconnects, and specialized computing hardware. Such designs tend to be useful only for specialized tasks due to the large scale of program organization required to successfully utilize most of the available resources at once. Supercomputers usually see usage in large-scale simulation, graphics rendering, and cryptography applications, as well as with other so-called “embarrassingly parallel” tasks.

Networking and the Internet. Computers have been used to coordinate information between multiple locations since the 1950s. The U.S. military’s SAGE (Semi Automatic Ground Environment) system was the first large-scale example of such a system, which led to a number of special-purpose commercial systems like Sabre. In the 1970s, computer engineers at research institutions throughout the United States began to link their computers together using telecommunications technology. This effort was funded by DARPA (now ARPA), and the

computer network that it produced was called the ARPANET. The technologies that made the Arpanet possible spread and evolved. In time, the network spread beyond academic and military institutions and became known as the Internet. The emergence of networking involved a redefinition of the nature and boundaries of the computer. Computer operating systems and applications were modified to include the ability to define and access the resources of other computers on the network, such as peripheral devices, stored information, and the like, as extensions of the resources of an individual computer. Initially these facilities were available primarily to people working in high-tech environments, but in the 1990s the spread of applications like e-mail and the World Wide Web, combined with the development of cheap, fast networking technologies like Ethernet and ADSL saw computer networking become almost ubiquitous. In fact, the number of computers that are networked is growing phenomenally. A very large proportion of personal computers regularly connect to the Internet to communicate and receive information. “Wireless” networking, often utilizing mobile phone networks, has meant networking is becoming increasingly ubiquitous even in mobile computing environments.

Notes

RAM – оперативное запоминающее устройство; *ROM* – постоянное запоминающее устройство; *BIOS (Basic Input/Output System)* – базовое устройство ввода/вывода; *to orchestrate* – организовывать, контролировать; *a cache memory* – сверхоперативное запоминающее устройство; *a lower-end market* – нижний эшелон рынка; *DARPA (Defense Advanced Research Projects Agency)* – Управление перспективных исследовательских программ; *ARPANET (Advanced Research Project Agency Network)* – сеть с коммутацией пакетов; явилась прообразом сети Интернет; *ADSL (Asymmetrical Digital Subscribers Line)* – асимметричная цифровая абонентская линия.

IV. Match these terms (1-10) with the correct meaning (A-J).

1 software	A component that coordinates all the other parts of the computer system
2 peripherals	B the brain of the computer
3 main memory	C physical parts that make up a computer system
4 hard drive (also known as hard disk)	D programs which can be used on a particular computer system
5 hardware	E the information which is presented to the computer
6 input	F results produced by a computer
7 ports	G input devices attached to the CPU

8 output	H section that holds programs and data while they are executed or processed
9 control unit	I magnetic device used to store information
10 central processing unit	J sockets into which an external device may be connected

V. Develop the following statements.

1. A computer is completely electronic. 2. A computer can remember information and hold it for future use. 3. A computer is programmable. 4. A typewriter, a calculator, or even an abacus could be called a computer.

VI. The four classes of general-purpose computers are microcomputers, minicomputers, mainframe computers and supercomputers. Can you briefly describe their essential characteristics?

VII. Look through the text again and answer these questions.

1. What is the general purpose and function of the CPU? 2. How many parts is the CPU composed of? 3. What is ALU? What are its functions? 4. What is the general purpose of the control? 5. What is the accumulator? 6. Where is the accumulator located?

VIII. Compare:

a) a memory and a CPU; b) an ALU and a control unit

IX. Summarize the information about (a) multitasking, (b) multiprocessing and (c) networking and the Internet.

Lesson 3. The computer revolution

I. Read and memorize the following words and word combinations:

complexity – сложность

to run – управлять

forecast – прогнозировать, прогноз

exploration – исследование, разведка

generation – поколение

attitude – зд. позиция

to encounter – сталкиваться

hazard – опасность

menace – угроза, угрожать

variety – множество, разнообразие

to plot – наносить на карту, чертить

signpost – указатель
to furnish – предоставлять
essential – существенный, неотъемлемый
to quantify – считать, определять количество
valid – правильный, обоснованный

II. Read and translate the text.

Without the computer space programs would be impossible and the 21st century would be impossible. The incredible technology we are building, the complexity and the knowledge we are amassing, are all beyond the unaided mind and muscle of man. More than any other single invention, perhaps even more than a wheel, the computer offers a promise so dazzling and a threat so awful that it will forever change the direction and meaning of our lives.

Computers today are running our factories, planning our cities, teaching our children, and forecasting the possible futures we may be heir to.

In the new age of exploration the computer is solving in milliseconds the problems a generation of mathematicians would need years to solve without its help. The small, fifty-nine-pound computer, which takes up only one cubic foot of space in the vehicle will do all of the mathematics needed, to solve one billion different space-maneuvering and navigation problems. Moreover, it translates the answer into simple numbers and tells the astronaut the altitude to which he must bring the spacecraft before firing the thrusters, and indicate to him exactly how long they must be fired.

Even before a rocket is launched, it is flown from ten to a hundred times through space-computer-simulated space-on flights constructed of mathematical symbols, on trajectories built of information bits, encountering hazards that are numbers without menace. For one of the computer's greatest assets is its ability to simulate one or a million variants of the same theme. "What if?" is the question the computer can answer accurately, swiftly, and over and over again. From this variety of possibilities, a trip from the Earth to the Moon can be simulated as often as necessary, with every possible trajectory plotted and every mile of the journey through space marked with symbolic signposts that will provide assurance that, mathematically at least, man has travelled this way before.

The computer can do far more than simulate the mechanics of space flight; it can furnish accurate models of life itself. In computer simulation, then, there may come the great breakthrough needed to convert the

inexact social sciences — the studies of man as a social being — into exact sciences. The one absolutely essential tool of science is the measuring device. Anything that can be counted, measured, quantified, can be studied with scientific accuracy. Now it becomes possible to perform controlled experiments, in which every factor that goes in is known in advance and the answers that come out are then valid.

Notes

The computer offers a promise so dazzling and a threat so awful firing – компьютер предлагает надежду столь блестящую и угрозу столь ужасную; *to fire the thrusters*–запускать двигатель; *there may come the great breakthrough* – может произойти большой прорыв.

III. Give the Russian equivalents.

The incredible technology, beyond the unaided mind and muscle of man, to forecast, be heir to; only one cubic foot of space, fifty-nine-pound computer, space-computer-simulated space-on flights, ability to simulate one or a million variants of the same theme, anything that can be counted, measured, quantified.

IV. Give the English equivalents.

Управлять заводами, планировать города, учить детей; поколения математиков; имитация, моделирование; сталкиваться с опасностью; аккуратно, быстро и снова и снова; множество возможностей; предоставлять точные модели самой жизни; управляемый эксперимент, где каждый фактор известен заранее.

V. Fill in the blanks.

1. The incredible technology /которую мы строим/ is beyond the unaided mind and muscle of man. 2. Computers today /управляют/ our factories, /планируют/ our cities, /учат/ our children. 3. The computer /решает/ in milliseconds the problems a generation of mathematicians would need years to solve without its help. 4. Even before a rocket /запущена/ it is flown through space-computer-simulated flights. 5. A trip from the Earth to the Moon /может быть смоделирован/ as often as necessary. 6. The computer /может предоставлять/ accurate models of life itself.

VI. Answer the following questions.

1. In what important field of science are computers used today? 2. How fast does a modern computer solve mathematical problems? 3. How much space does modern computer take in a vehicle? 4. What is made with a rocket before it is launched into space? 5. What is one of computer's greatest assets? 6. What important question can computer answer over and over again? 7. What great breakthrough may come in computer simulation? 8. What experiments can be performed now?

VII. Give a brief summary of the text.

VIII. Read the text and translate it without a dictionary. Give a short summary of it.

The history of computers

The concepts of digital computing and representing information in binary form can be traced back to the 1800s. Mechanical devices using these techniques were large, expensive, noisy, slow and unreliable. It was not until the first electronic digital computer, ENIAC, appeared in the late 1940s that practical digital computing was possible. ENIAC, which used vacuum tubes, was still large, expensive, noisy, and unreliable, but it was faster. Much more work could be performed in a much shorter time. As capability of these devices grew, computer makers kept stuffing more into their products. Soon computers were so complicated and expensive that only very large businesses could afford them. The idea of many smaller, inexpensive computers doing much of the work of the larger machines started the "revolution". Transistors reduced size and power consumption and further increased reliability and speed of operation.

Computers have been around for many years, but it is the development of large-scale integrated circuits (LSICs), however, that has let the computer affect everyone's life. They have been one of the dominant factors in the growth of electronics. Without them we would not have so much capability in so little space. Integrated circuits (IC) gave us further improvements, and LSICs put the computer into general public's hands. Large-scale integration has actually been able to put a complete computer on a single IC. These ICs are called microprocessors, and when combined with input and output devices, are called microcomputers. Now we encounter the microcomputer daily. The computer can be programmed to do almost any task involving decisions and actions.

Notes

ENIAC – *Electronic Numerical Integrator and Calculator*; *computer makers kept stuffing more into their products* – изготовители компьютеров продолжали укомплектовывать свою продукцию все более сложными элементами; *complicated* – сложный.

UNIT 2. HARDWARE

Lesson 1. Inside the computer case

I. Read and memorize the following words and word combinations:

be little intimidating – немного пугающие

solder – припой

to pop in – заглянуть

insight – понимание сути

troubleshooting process – процесс поиска неисправности

tangible objects – материальные объекты

chassis – блок

to comprise – включать

circuitry – схема

II. Read and translate the text.

Some people get a little excited when they look inside a computer and see all the different electrical components and circuit boards. All the wires, connectors and data cables inside tend to be a little intimidating. Yet, all of today's computer repairs, replacements, upgrades and installations are getting easier and easier.

A technician could spend hours to search for a specific chip or failed solder connection that's causing a particular problem. Repairs aren't done at the chip level anymore. Everything is very modular. It's quicker, easier, and much more economical to have the technician pop in a whole new video card or motherboard.

It's necessary to know some of the different components and what they do. It can give you an insight as to which particular module may need replacement, and aids in the troubleshooting process.

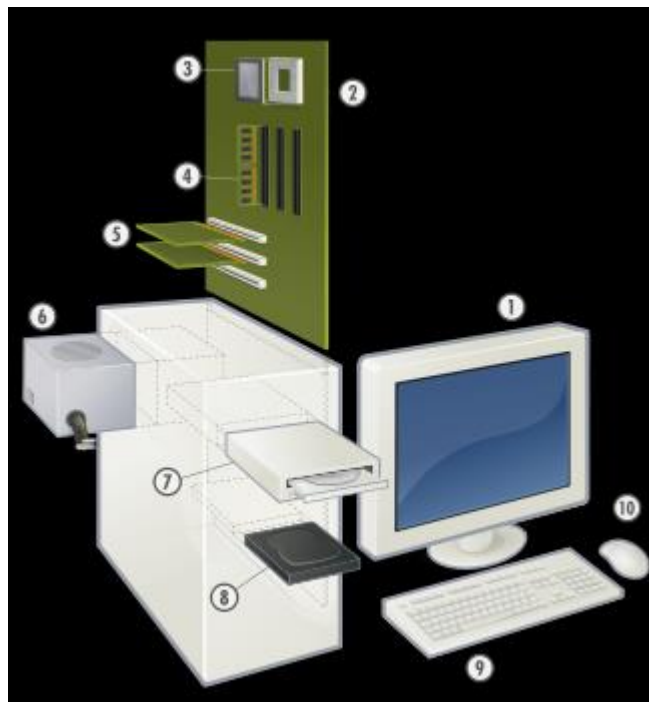
A personal computer is made up of multiple physical components of computer hardware, upon which can be installed an operating system and a multitude of software to perform the operator's desired functions.

The term "hardware" covers all those parts of a computer that are tangible objects. Circuits, displays, power supplies, cables, keyboards,

printers and mice are all hardware.

Though a PC comes in many different form factors, a typical personal computer consists of a case or chassis in a tower shape (desktop) and the following parts:

1. Monitor
2. Motherboard
3. CPU
4. RAM
5. Expansion card
6. Power supply
7. CD-ROM drive
8. Hard disk
9. Keyboard
10. Mouse



III. Give the Russian equivalents.

Computer case, connector, to install, wire, circuit board, connector, technician, upgrade, multitude, chassis, keyboard, replacement, troubleshooting.

IV. Give the English equivalents.

Корпус компьютера, соединитель (разъем), установить, монтажная плата, соединитель, техник, карта расширения, обновление, множество, блок, клавиатура, замена, провод (проводник).

V. Have a look at the picture and label the elements of this computer system.

VI. Translate the words of the same root. Define speech parts.

To connect – a connector – connection – connectible; to install – installation – an instalment; a place – to place – to replace – a replacement; a multiple – multiplication – to multiply – a multiplier; to perform – performance – a performer.

VII. Complete the sentences according to the text.

1. All the wires, connectors _____ inside a computer sometimes tend to be a little intimidating. 2. A technician spent hours to search for a specific _____ or failed solder connection that's causing a particular problem. 3. It's quicker, easier, and much more economical to have _____ in a whole new video card or motherboard. 4. The term _____ covers all those parts of a computer that are tangible objects. 5. A personal computer is made up of multiple _____ of computer hardware.

VIII. Think of ways in which you can describe:

- a) the term "hardware"
- b) the PC modular system
- c) computer's hardware.

Lesson 2. Processing

I. Before reading the text try to answer the following questions:

- 1. What is the main function of a computer's processor?
- 2. What unit of frequency is used to measure processor speed?

II. Read the text.

The nerve centre of a PC is the processor, also called the CPU, or central processing unit. This is built into a single chip that executes program instructions and coordinates the activities that take place within the computer system. The chip itself is a small piece of silicon with a

complex electrical circuit called an integrated circuit.

The processor consists of three main parts.

The control unit examines the instructions in the user's program, interprets each instruction and causes the circuits and the rest of the components — monitor, disk drives, etc. — to execute the functions specified.

The arithmetic logic unit (ALU) performs mathematical calculations (+, -, etc.) and logical operations (AND, OR, NOT).

The registers are high-speed units of memory used to store and control data. One of the registers (the program counter, or PC) keeps track of the next instruction to be performed in the main memory. The other (the instruction register, or IR) holds the instruction that is being executed.

The power and performance of a computer is partly determined by the speed of its processors. A system clock sends out signals at fixed intervals to measure and synchronize the flow of data. Clock speed is measured in gigahertz (GHz). For example, a CPU running at 4GHz (four thousand million hertz, or cycles, per second) will enable your PC to handle the most demanding applications.

III. Answer the questions.

1. What are the main parts of the CPU? 2. What does ALU stand for? What does it do? 3. What is the function of the system clock? 4. How much is one gigahertz?

IV. What do the words in bold type refer to?

1. **This** is built into a single chip.
2. ___**which** executes program instructions and coordinates....
3. ___**that** is being executed.
4. ___performance of a computer is partly determined by the speed of **its** processor.

V. Translate the following text in writing.

The central processing unit (CPU) is the main IC chip on your computer's motherboard. They come in different shapes, sizes and packages. Older CPUs came in the DIP format, and some 286s and early 386s were QSOPs, but what you'll see the most are the flat, square PGA or SPGA chips.

CPU is considered the "brain" of your computer. It controls and directs all the activities of the computer, transmitting, receiving and processing data constantly. But like the "brain" of any project or

organization, it relies very heavily on its support group and advisors. There are a lot of factors involved that are related to the CPU and have an effect on the speed and performance of your machine. Some of these factors include:

- a) Whether there's a math coprocessor present and if it's internal or external.
- b) The clock speed of the system and of the CPU. The amount of internal cache and external cache available.
- c) The bus architecture or supporting circuitry on the motherboard.

Notes

DPI – *Dual Inline Package* – корпус с двумя рядами контактов; *QSOP* – *Quarter Size Outline Package* – корпус шириной в ¼ дюйма; *PGA* – *Pin Grid Array* – корпус с матрицей игольчатых приводов; *SPGA* – *Staggered Pin Grid Array* – ступенчатая матрица приводов; *clock speed* – тактовая частота; *cache* – «кэш», промежуточная память с большой производительностью

Lesson 3. Motherboard

I. Read and memorize the following words:

to attach – присоединять

to reside – постоянно находиться

to enable – позволять, делать возможным

to mediate – посредничать

chipset – набор микросхем

to handle – обрабатывать

firmware – встроенное программное обеспечение

boot – загрузка; выполнять начальную загрузку

heat sink – радиатор

fan – вентилятор

controller – контроллер, устройство управления, диспетчер

additional core features – дополнительные основные особенности

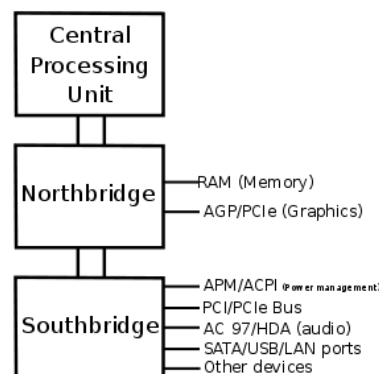
bus – шина, магистральная шина

internal bus – внутренняя шина

external bus controller – контроллер внешней шины

II. Read and translate the text.

A motherboard is the central printed circuit board (PCB) in some complex electronic systems, such as modern personal computers. The



motherboard is sometimes alternatively known as the main board, system board, or, on Apple computers, the logic board. It is also sometimes casually shortened to “mobo”.

The motherboard is the “body” of the computer. Components directly attached to the motherboard include CPU, chips, RAM, BIOS, buses and bus controllers.

The central processing unit performs most of the calculations which enable a computer to function, and is sometimes referred to as the “brain” of the computer. It is usually cooled by a heat sink and fan.

All the chips that reside on the motherboard are known as the chipset. The chipset mediates communication between the CPU and the other components of the system, including main memory.

RAM stores all running processes (applications) and the current running OS. RAM Stands for Random Access Memory.

The BIOS (Basic Input/Output System) includes boot firmware and power management. Operating system drivers handle the **Basic Input Output System** tasks.

Internal Buses connect the CPU to various internal components and to expansion cards for graphics and sound.

External Bus Controllers support ports for external peripherals. These ports may be controlled directly by the Southbridge I/O controller or are based on expansion cards attached to the motherboard through the PCI bus (see the scheme of a typical chipset layout).

On most PCs, it is possible to add memory chips directly to the motherboard. You may also be able to upgrade to a faster PC by replacing the CPU chip. To add additional core features, you may need to replace the motherboard entirely.

Notes

Southbridge controller– Южный мост, контроллер-концентратор ввода-вывода (в отличие от *Northbridge controller*– северный мост, контроллер-концентратор памяти). Названия можно объяснить представлением архитектуры чипсета в виде карты. Процессор располагается на вершине карты, на севере. Соединен с остальной частью материнской платы через согласующий интерфейс и южный мост.

III. Give the English equivalents.

Circuit board, complex, electronic systems, motherboard, logic board, calculations, chipset, controller, to mediate, bus, external peripherals, Southbridge controller, external bus controller, printed circuit board.

IV. Think of ways in which you can explain the following abbreviations. Translate them into Russian.

a) PCB; b) CPU; c) OS; d) RAM; e) PCI bus; f) BIOS

V. Review the text, find the key words or phrases in each passage and use them to summarise the text.

VI. Find some additional information and write short reports about:

a) Bus controllers; b) Basic Input /Output Systems

Lesson 4. Buses and cards

I. The following word combinations will help you to translate this text:

expansion slot – расширительное гнездо, разъем

expansion card – плата расширения

edge connector – торцевой разъем

compatibility card – плата совместимости

front side bus – фронтальная шина

The main circuit board inside the computer system is the motherboard. It contains the processor, the memory chips, expansion slots, and controllers for peripherals, connected by buses — electrical channels that allow devices inside the computer to communicate with each other. For example, the front side bus carries all data that passes from the CPU to other devices.

The size of a bus, called bus width, determines how much data can be transmitted. It can be compared to the number of lanes on a motorway — the larger the width, the more data can travel along the bus. For example, a 64-bit bus can transmit 64 bits of data.

Expansion slots allow users to install expansion cards, adding features like sound, memory and network capabilities.

An expansion card (also an expansion board, adapter card or accessory card) in **computing** is a **printed circuit board** that can be inserted into an expansion slot of a **computer motherboard** to add additional functionality to a computer system. One edge of the expansion card holds the contacts (the **edge connector**) that fit exactly into the slot. They

establish the electrical contact between the electronics (mostly [integrated circuits](#)) on the card and on the motherboard. The primary purpose of an expansion card is to provide or expand on features not offered by the motherboard.

Expansion card types

- [Video cards](#)
- [Sound cards](#)
- [Network cards](#)
- [TV tuner cards](#)
- [Video processing expansion cards](#)
- [Modems](#)
- [Host adapters](#) such as [SCSI](#) and [RAID](#) controllers
- [POST cards](#)
- [BIOS Expansion ROM cards](#)
- [Compatibility card](#)
- [Physics cards](#) (commercially available at present)
- [Disk controller cards](#) (for fixed – or removable –media drives)
- [Interface adapter cards](#), including parallel port cards, serial port cards, multi-I/O cards, USB port cards, and proprietary interface cards
- [RAM disks](#), e.g. [I-RAM](#)
- [Memory expansion cards](#)
- [Hard disk cards](#)
- [Clock/calendar cards](#)
- [Security device cards](#)
- [Radio tuner cards](#)

II. Answer the questions.

1. What term is used to refer to the main printed circuit board? 2. What is a bus? 3. What is the benefit of having expansion slots?

III. Translate the words of the same root. Define speech parts.

To expand – an expanse – expansible – an expansion – expansive; to compute – a computer – computation; to connect – a connector – connection; to establish – an establishment – established; to provide – providence – a provider – provident.

III. State the character of this text (scientific, popular science, newspaper article, encyclopaedia). Explain your choice.

IV. Find some additional information about one of the expansion card types. Write a short report.

Lesson 5. Power Supply

I. Read and translate the text.

The component that supplies power to a **computer** is also called a power supply unit or PSU. Most **personal computers** can be plugged into standard electrical outlets. The power supply then pulls the required amount of electricity and converts the AC to DC. It also regulates the voltage to eliminate spikes and surges common in most electrical **systems**. Not all power supplies, however, do an adequate voltage-regulation job, so a computer is always susceptible to large voltage fluctuations.

Power supplies are rated in terms of the number of watts they generate. The more powerful the computer, the more watts it can provide to components.

II. Transcribe, practice the pronunciation and remember the translation of the following words:

power supply – блок питания

to plug – подключать

electrical outlet – электрическая розетка

spike – выброс, скачок

surge – помеха

susceptible – восприимчивый, чувствительный

fluctuations – колебания

III. Find the key words that can help you to retell the text. Retell the text.

IV. Make a report on:

- a) The problem of computer system's stability.
- b) The problem of surge protection of the internal buses and the components.

Lesson 6. Hard disk

I. Read and translate the text.

Hard disk is a magnetic **disk** on which you can **store computer data**. The term “**hard**” is used to distinguish it from a soft, or floppy, disk. Hard disks hold more data and are faster than **floppy disks**. A hard disk, for example, can store anywhere from 10 to more than 100 **gigabytes**, whereas most floppies have a maximum **storage** capacity of 1.4 megabytes.

A single hard disk usually consists of several **platters**. Each platter requires two **read/write heads**, one for each side. All the read/write heads are attached to a single **access** arm so that they cannot move independently. Each platter has the same number of **tracks**, and a track location that cuts across all platters is called a **cylinder**. For example, a typical 84-megabyte hard disk for a **PC** might have two platters (four sides) and 1,053 cylinders.

In general, hard disks are less **portable** than floppies, although it is possible to buy **removable hard disks**.

II. Consult the dictionary and find the definitions of the following terms. Write them down.

a) Floppy disk; b) hard disk; c) storage capacity; d) single access arm; e) platter; f) cylinder

III. Choose the suitable word to complete the sentence.

1. _____ is the track location that cuts across all platters. 2. _____ is an item of factual information derived from measurement or research. 3. _____ is a rigid magnetic disk mounted permanently in a drive unit. 4. _____ is a unit of information equal to 1000 megabytes. 5. _____ is one of the circular magnetic paths on a magnetic disk that serve as a guide for writing and reading data. 6. _____ is a data storage medium that is composed of a disk of thin, flexible **magnetic storage** medium.

IV. Ask your group-mates questions on the text.

UNIT 3. STORAGE DEVICES

Lesson 1. Computer storage

I. Read and translate the text.

A computer's memory can be viewed as a list of cells into which numbers can be placed or read. Each cell has a numbered “address” and can store a single number. The computer can be instructed to “put the number 123 into the cell numbered 1357” or to “add the number that is in cell 1357

to the number that is in cell 2468 and put the answer into cell 1595". The information stored in memory may represent practically anything. Letters, numbers, even computer instructions can be placed into memory with equal ease. Since the CPU does not differentiate between different types of information, it is up to the software to give significance to what the memory sees as nothing but a series of numbers.

In almost all modern computers, each memory cell is set up to store binary numbers in groups of eight bits (called a byte). Each byte is able to represent 256 different numbers; either from 0 to 255 or -128 to +127. To store larger numbers, several consecutive bytes may be used (typically, two, four or eight). When negative numbers are required, they are usually stored in two's complement notation. Other arrangements are possible, but are usually not seen outside of specialized applications or historical contexts. A computer can store any kind of information in memory as long as it can be somehow represented in numerical form. Modern computers have billions or even trillions of bytes of memory.

The CPU contains a special set of memory cells called registers that can be read and written to much more rapidly than the main memory area. The registers are high-speed units of memory. One of the registers (the program counter, or PC) keeps track of the next instruction to be performed in the main memory. The other (the instruction register, or IR) holds the instruction that is being executed. There are typically between two and one hundred registers depending on the type of CPU. Registers are used for the most frequently needed data items to avoid having to access main memory every time data is needed. Since data is constantly being worked on, reducing the need to access main memory (which is often slow compared to the ALU and control units) greatly increases the computer's speed.

Computer's main memory comes in two principal varieties: random access memory or RAM and read-only memory or ROM. RAM can be read and written to anytime the CPU commands it, but ROM is pre-loaded with data and software that never changes, so the CPU can only read from it. ROM is typically used to store the computer's initial start-up instructions. In general, the contents of RAM is erased when the power to the computer is turned off while ROM retains its data indefinitely. In a PC, the ROM contains a specialized program called the BIOS that orchestrates loading the computer's operating system from the hard disk drive into RAM whenever the computer is turned on or reset. In embedded computers, which frequently do not have disk drives, all of the software required to perform the task may be stored in ROM. Software that is stored in ROM is often called firmware because it is notionally more like hardware than

software. Flash memory blurs the distinction between ROM and RAM by retaining data when turned off but being rewritable like RAM. However, flash memory is typically much slower than conventional ROM and RAM so its use is restricted to applications where high speeds are not required.

In more sophisticated computers there may be one or more RAM cache memories which are slower than registers but faster than main memory. Generally computers with this sort of cache are designed to move frequently needed data into the cache automatically, often without the need for any intervention on the programmer's part.

II. Answer the questions.

1. What type of memory is temporary? 2. What type of memory is permanent and includes instructions needed by the CPU? 3. How can RAM be increased? 4. How many digits does a binary system use? 5. What is a bit? 6. What is a collection of 8 bits called? 6. What code do computers use to make calculations? 7. What two states do electronic circuits differentiate? 8. How do computers represent characters? 9. What units are used to avoid complex calculations? 10. Do you know what ASCII – pronounced /'æski/ – stand for? 11. What memories are used in microcomputers?

III. Study the following table. It might be useful for you.

Unit of memory	Abbreviation	Exact memory amount
Binary digit	bit, b	1 or 0
Byte	B	8 bits
Kilobyte	KB or K	1,024 bytes
Megabyte	MB	1,024 KB, or 1,048,576 bytes
Gigabyte	GB	1,024 MB, or 1,073,741,824 bytes
Terabyte	TB	1,024 GB, or 1,099,511,627,776 bytes

IV. Complete these descriptions with the correct unit of memory.

1. A _____ is about one trillion bytes – about as much text as the books and magazines in a huge library. 2. A _____ is about one million bytes – about as much text as a 300-page novel. 3. A _____ is about one billion bytes – about as much text as 1,000 books. 4. A _____ is about one

thousand bytes – equivalent to one sheet of A4. 5. A_____ can store a single character, such as the letter *h* or number 7.

V. What do you call a unit which:

- 1) accepts information from outside a computer?
- 2) memorizes information to be operated on?
- 3) brings information out of the computer?

V. Make up the summary of the text in writing.

Lesson 2. Magnetic storage

I. Read and translate the text.

Magnetic storage devices store data by magnetizing particles on a disk or tape. There are basically three types of magnetic storage devices available to the computer user — 3.5"floppy drives and diskettes, hard drives and tapes.

A floppy disk is so called because it consists of a flexible sheet of plastic, coated with iron oxide — a magnetizable material. A floppy disk drive spins at 360 revolutions per minute (rpm), so it's relatively slow. However, a hard drive spins at over 7,200rpm and stores data on a stack of metal rotating disks called platters. This means you can store much more data and retrieve information much faster.

New disks need to be formatted though as a rule they come preformatted from the manufacturer. The operating system (OS) organizes the disk surface into circular tracks and divides each track into sectors. The OS creates a directory which will record the specific location of files. When you save a file, the OS moves the read/ write head of the drive towards empty sectors, records the data and writes an entry for the directory. Later on, when you open that file, the OS looks for its entry in the directory, moves the read/ write heads to the correct sector and reads the file in the RAM area.

The OS allows you to create one or more partitions on the hard drive, in effect dividing it into several logical parts. Partitions allow installing more than one OS on the computer. The user can also split the hard drive to store the OS and programs on one partition (this is the internal hard drive usually called C: drive) and data files on another so that when a problem occurs the OS may be reinstalled without affecting the data partition.

External hard drives are connected to the USB or FireWire port of the computer. They can be as small as a wallet but can have as much capacity as internal drives; they are usually used for backup or as secondary storage.

Hard drives are very sensitive to vibration and shocks, especially when they are operating.

A tape drive reads and writes data on tapes. It is sequential-access — i.e. to get to a particular point on the tape, it must go through all the preceding points. Tapes are used for data collection, backup and archiving.

The average time required for the read/ write heads to move and find data is called seek time (or access time) and is measured in milliseconds. Seek time shouldn't be confused with transfer rate — the average speed required to transmit data from the disk to the CPU, measured in megabytes per second.

II. Decide whether these sentences are true or false. Correct the false ones.

1. A hard drive spins at the same speed as a floppy disk drive. 2. If you format a hard drive that has files on it, the files will be deleted. 3. Hard drives cannot be partitioned to run separate operating systems on the small disk. 4. Seek time and transfer rate mean the same thing. 5. Disk drives are not shock resistant, especially in operating mode.

III. Read each paragraph carefully and say briefly what they are about.

IV. Speak on advantages and disadvantages of magnetic storage devices.

V. Read the text and translate it into Russian. Write a short summary of it.

The function of the memory unit is to store programs and data. This function can be accomplished with a variety of equipment. It is useful to distinguish between two classes of memory devices which comprise the prime and secondary storage. Primary storage, or the main memory, is a fast memory capable of operating at electronic speeds, where programs and data are stored during their execution. The main memory contains a large number of semiconductor storage cells, each capable of storing one bit of information. These cells are rarely read or written as individual cells. Instead, they are processed in groups of fixed size called words. The

main memory is organized so that the contents of one word, containing n bits, can be stored or retrieved in one basic operation.

To provide easy access to any word in the main memory, it is useful to associate a distinct name with each word location. These names are numbers that identify successive locations, which are hence called address. A given word is accessed by specifying its address and issuing a control command that starts the storage or retrieval process.

The number of bits in each word is often referred to as the word length of the given computer. Large computers usually have 32 or more bits in a word, while microcomputer and minicomputer word lengths range from 8 to 32 bits. Small machines may have only a few thousand words, large machines often have millions of words. Data is usually manipulated within a machine in units of words, multiples of words, or submultiples of words. A typical access to the main memory results in one word of data being read from the memory or written into it.

Notes

Can be stored or retrieved – зд. могут быть найдены; *successive locations* – последовательные ячейки. *Data is usually manipulated* – С данными обычно работают.

Lesson 3. Optical discs and drives

I. Before reading the text discuss these questions:

- 1. What do CD and DVD stand for?*
- 2. What is the main advantage of using DVDs instead of CDs?*
- 3. What is the Blue-ray format? Where does it get its name?*

II. Read and translate the text.

Optical discs can store data at much higher densities than magnetic discs. They are therefore ideal multimedia applications where images, animation and sound occupy a lot of disc space. Optical discs are not affected by magnetic fields, so they are secure and stable, and can be transported through metal detectors without damaging the data. However, optical drives are slower than hard drives.

At first sight, a DVD is similar to a CD. Both discs are 120 mm in diameter and 1.2 mm thick. They also both use a laser beam to read data. However, they are very different in internal structure and data capacity. In a DVD, tracks are very close together, thus allowing more tracks. The pits in which data is stored are also smaller, so there are more pits per track. As a result, a CD can hold 650-700 MB, whereas a basic DVD can hold 4.7 GB.

CDs come in three different formats:

- CD-ROMs are read-only units, meaning you cannot change the data stored on them.

- CD-R (recordable) discs are write-only devices that let you duplicate other CDs.

- CD-RW (rewritable) discs enable a user to write onto them many times, just like a hard disk.

A CD-ROM drive is a **device** that can **read** information from a **CD-ROM**. CD-ROM drives can be either internal, in which case they fit in a **bay**, or external, in which case they generally connect to the **computer's** USB or ESATA. ESATA CD-ROM drive is easier to install, but it has several disadvantages. It's somewhat more expensive than internal drives and ESATA can be rarely implemented in the motherboards. USB is easier to install and connect. It's possible to move USB drive between different PCs.

There are a number of features that distinguish CD-ROM drives, the most important of which is probably their speed. CD-ROM drives are generally classified as single-speed or some multiple of single-speed.

Two more precise measurements are the drive's **access time** and **data transfer rate**. The access time measures how long, on average, it takes the drive to **access** a particular piece of information. The data transfer rate measures how much data can be read and sent to the computer in a second.

DVDs also come in several formats:

- DVD-ROMs are used in DVD computer drives. They allow for data archiving as well as interactive content.

- DVD-R or DVD+R can only be recorded on once.

- DVD-RW or DVD+RW discs can be erased and reused many times.

The DVD drive used in computers is also called a DVD burner because it records information by burning via a laser to a blank DVD disc.

HD-DVD and Blue-ray discs are expected to replace current DVD. HD stands for high definition. A Blue-ray disc has a capacity of 25GB, 50 GB and 100 GB. Unlike DVDs, which use a red laser to read and write data, Blue-ray uses a blue-violet laser, hence its name.

Notes

USB – Universal Serial Bus – универсальная последовательная шина; *ESATA – External Serial Advanced Technology Attachment* – последовательный интерфейс подключения внешних устройств (в отличие от *SATA* – последовательного интерфейса обмена данными с

накопителями); *CD-ROM* – *compact disc read-only memory* – компактный оптический диск с данными.

III. Give the Russian equivalents.

Device, disadvantage, bay, to distinguish, precise, measurement, access time, data transfer rate, average, to implement, feature, speed, to classify, laser beam, via, burner, high definition.

IV. Give the English equivalents.

Данные, скорость, классифицировать, устройство, скорость передачи данных, особенность, среднее число, отсек, время доступа, различать, недостаток, измерение, осуществить, точный.

V. Complete the following sentences.

1. A CD-ROM drive is _____ that can read information from a CD-ROM. 2. CD-ROM drives can be either _____, or _____. 3. CD-ROM drives are generally classified as _____. 4. Two more precise measurements are _____ and _____. 5. _____ measures how long it takes the drive to access a particular piece of information. 6. _____ measures how much data can be read and sent to the computer in a second.

VI. Sum up the contents of the text by answering the following questions:

1. What is a CD-ROM? 2. What is the difference between the internal CD-ROM and external CD-ROM drives? 3. What advantages of USB CD-ROM drive can you name? 4. ESATA drives have some disadvantages. What are they? 5. There are a number of features that distinguish CD-ROM drives, aren't there? What are they? 6. What does the data transfer rate measure? 7. What is the basic function of disk drives?

UNIT 4. PERIPHERALS

Lesson 1. Monitor

I. Before reading the text look at the words below. How many of them do you know? Look up the unknown words in the dictionary.

An enclosure, to classify, a device, liquid, permanent, capability, monochromic, background, foreground, to measure, to accept, an inch.

II. Read and translate the text.

A monitor or display (sometimes called a visual display unit) is a piece of **electrical equipment** which displays images generated by devices such as **computers**, without producing a permanent record. The computer sends a signal to the video adapter, telling it what character, image or graphic to display. The video adapter converts that signal to a set of instructions that tell the display device (monitor) how to draw the image on the screen. The monitor comprises the actual display device, **circuitry**, and an enclosure. The display device in modern monitors is typically a **thin film transistor liquid crystal display** (TFT-LCD), while older monitors use a **cathode ray tube** (CRT).

There are many ways to classify monitors. The most basic is in terms of colour capabilities, which separates monitors into three classes:

a) **monochrome**: Monochrome monitors actually display two colours, one for the **background** and one for the **foreground**. The colours can be black and white, green and black, or amber and black.

b) **grey-scale**: A grey-scale monitor is a special type of monochrome monitor capable of displaying different shades of grey.

c) **colour**: **Colour monitors** can display anywhere from 16 to over 1 million different colours. Colour monitors are sometimes called **RGB monitors** because they accept three separate signals — red, green, and blue.

After this classification, the most important aspect of a monitor is its screen size. Like televisions, screen sizes are measured in diagonal inches, the distance from one corner to the opposite corner diagonally. A typical size for small **VGA** monitors is 14 inches. Monitors that are 16 or more inches diagonally are often called full-page monitors.

The **resolution** of a monitor indicates how densely packed the pixels are. In general, the more pixels (often expressed in **dots per inch**), the sharper the image. Another common way of classifying monitors is in terms of the type of signal they accept — **analogue** or **digital**.

III. What do the following abbreviations stand for?

a) TFT; b) LCD; c) CRT; d) RGB (monitor); e) VGA (monitor)

IV. Work with the dictionary and find the meanings of the following words. Try to explain them in English.

Equipment; video adapter; device; pixel

V. What do you call

1. a set of tools or devices used for a particular purpose?
2. the smallest discrete component of an image or picture on a CRT screen (usually a coloured dot)?
3. a machine or tool used for a particular purpose?
4. a **board** that plugs into a **personal computer** to give it display capabilities?
5. a screen used to display certain kinds of information, for example in airports or television studios?
6. a mental picture of someone or something produced by the imagination or memory?

VI. Arrange synonyms in pairs and give their Russian equivalents.

- A) Display, character, convert, separate, measure, indicate;
- B) Point, quantify, symbol, monitor, divide, alter.

VII. Ask your group-mates 3 or 4 questions on the text.

Lesson 2. Keyboard

I. Read the text.

The term “peripherals” refers to a large class of auxiliary devices that may be connected to a computer. Most peripherals are used either for data storage or for input or output. Although some are virtually essential (there are few computers without keyboards and screens), many peripherals are optional adjuncts to the operation of a computer.

Input devices are the pieces of hardware which allow us to enter information into the computer. The most common are the keyboard and the mouse. We can also interact with a computer by using one of these: a light pen, a scanner, a trackball, a graphics tablet, a game controller or a microphone.

II. Complete these sentences.

1. This device is ____ enter information into the computer.
2. ____ it may also ____ function keys and editing keys ____ special purposes.
3. This is a device ____ the cursor and selecting items on the screen.
4. It usually ____ two buttons and a wheel.
5. ...the user ____ active icons or select items and text.
6. It ____ detecting light from the computer screen and is used by pointing it directly at the screen display.
7. It ____ the used ____ answer multi-choice questions and...

III. Choose one of the input devices given below and describe its functions and features.

A bar code reader; a touchpad on a portable PC; a webcam; a touch screen.

IV. Read and translate the text.

The keyboard

The set of typewriter-like **keys** that enables you to enter **data** into a **computer** is called a keyboard. Computer keyboards are similar to electric-typewriter keyboards but contain additional keys. The keys on computer keyboards are often classified as follows:

Alphanumeric keys represent letters and numbers, as arranged on a typewriter.

Punctuation keys represent comma, period, semicolon, and so on.

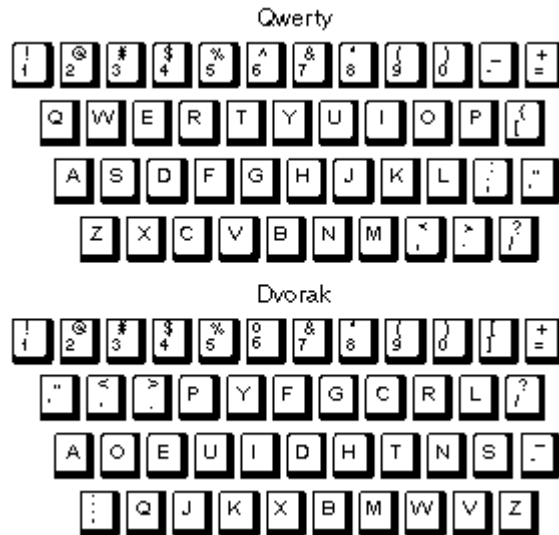
Special keys comprise **function keys**, control keys, **arrow keys**, **Caps Lock key**, etc.

Function keys appear at the top of the keyboard and can be programmed to do special tasks.

Cursor control keys include arrow keys that move the insertion point up, down, right and left, and keys such as *End*, *Home*, *Page Up* and *Page Down*, which are used in word processing to move around a long document.

Dedicated keys are used to issue commands or to produce alternative characters, e.g. the *Ctrl* key or the *Alt* key.

A numeric keypad appears to the right of the main keyboard. The *Num Lock* key is used to switch from numbers to editing keys.



The standard layout of letters, numbers, and punctuation is known as a **QWERTY keyboard** (pronounced *kwer-tee*) because the first six keys on the top row of letters spell QWERTY. The arrangement of characters on a QWERTY keyboard was designed in 1868 by Christopher Sholes, the inventor of the typewriter. According to a popular myth, Sholes arranged the keys in their odd fashion to prevent jamming on mechanical typewriters by separating commonly used letter combinations. However, there is no evidence to **support** this assertion, except that the arrangement does, in fact, inhibit fast typing.

Another keyboard design, which has letters positioned for speed typing, is the **Dvorak keyboard**. The Dvorak keyboard was designed in the 1930s by August Dvorak, a professor of education, and his brother-in-law, William Dealy. Unlike the traditional **QWERTY keyboard**, the Dvorak keyboard is designed so that the middle row of keys includes the most common letters. In addition, common letter combinations are positioned in such a way that they can be typed quickly.

There is no standard computer keyboard, although many manufacturers imitate the keyboards of **PCs**.

V. Match the descriptions (1-8) with the names of the keys (a-h).

1 A long key at the bottom of the keyboard. Each time it is pressed, it produces a blank space.	<i>a</i> arrow keys
2 It moves the cursor to the beginning of a new line. It is also used to confirm commands.	<i>b</i> return/ enter
3 It works in combination with other keys. For example, you press this key and <i>C</i> to copy the selected text.	<i>c</i> Caps Lock
4 It removes the character to the left of the cursor or any selected text.	<i>d</i> shift
5 It produces UPPER CASE characters.	<i>e</i> tab
6 It produces UPPER CASE letters, but it doesn't affect numbers or symbols.	<i>f</i> space bar
7 It moves the cursor horizontally to the right for a fixed number of spaces (in tabulations and data fields).	<i>g</i> backspace
8 They are used to move the cursor, as an alternative to the mouse.	<i>h</i> Ctrl

VI. Translate the text in writing.

Computers originally dealt only with letters and numbers as input, so the keyboard is the oldest and most widespread input device. In addition to the basic typewriter arrangement of letters and numbers plus shift key, tab, and so forth, computer keyboards typically contain additional specialized keys. Control (Ctrl) and alternate (Alt) keys are used in conjunction with letter or number keys to issue commands from the keyboard to programs that are running on the computer. For example, Ctrl-C is a key combination often used to “break” or interrupt a program run and return control to the operating system. Function keys (typically ten or twelve) may have frequently used operations assigned to them by various programs one might run. For example, F1 (function key 1) might be used to get on-screen help, F3 to undo the last operation, and F10 to save the file. Cursor keys are used to move the cursor (a blinking line or rectangle indicating the currently active location on the screen) under keyboard control. Additional keys for insert, delete, page up, page down, and other operations help one move around in files during editing. The numeric keypad found on many keyboards is a convenience if many numbers must be entered, because the hand can stay in one location (typically at the right-hand side of the keyboard) rather than having to move back and forth on the top row.

The keyboard communicates with the operating system by issuing an interrupt for every key press. It normally has its own connector to the system unit and so does not occupy an I/O port.

Lesson 3. Mouse

I. Read and translate the text.

A **device** that controls the movement of the **cursor** or **pointer** on a **display screen** is a mouse. A mouse is a small **object** you can roll along a hard, flat surface. Its name is derived from its shape, which looks a bit like a mouse, its connecting wire that one can imagine to be the mouse's tail, and the fact that one must make it scurry along a surface. As you move the mouse, the pointer on the display screen moves in the same direction. **Mice** contain at least one **button** and sometimes as many as three, which have different functions depending on what **program** is **running**. Some newer mice also include a scroll wheel for scrolling through long documents.

Invented by Douglas Engelbart of Stanford Research Center in 1963, and pioneered by **Xerox** in the 1970s, the mouse is one of the greatest breakthroughs in **computer ergonomics** because it frees the **user** to a large extent from using the **keyboard**. In particular, the mouse is important for **graphical user interfaces** because you can simply point to **options** and objects and **click** a mouse button. Such **applications** are often called point-and-click programs. The mouse is also useful for **graphics** programs that allow you to draw pictures by using the mouse like a pen, pencil, or paintbrush.

There are three basic types of mice.

A *mechanical* mouse has a rubber or metal ball on its underside that can roll in all directions. Mechanical sensors within the mouse detect the direction the ball is rolling and move the screen pointer accordingly.

An *optomechanical* mouse is the same as a mechanical mouse, but uses optical sensors to detect motion of the ball.

An *optical* mouse uses a laser to detect the mouse's movement. You must move the mouse along a special mat with a grid so that the optical mechanism has a frame of reference. Optical mice have no mechanical moving parts. They respond more quickly and precisely than mechanical and optomechanical mice, but they are also more expensive.

Do you know what Mighty Mouse, Lisa Mouse and Bus Mouse mean?

The name given to [Apple's](#) first multi-button [mouse](#), was launched in 2005. This was the first mouse manufactured and sold by Apple Computers since the [Lisa era in 1983](#) that contained more than a single button. The Mighty Mouse offers four separate button areas including a touch-sensitive top for both the left and right click, a 360-degree clickable scroll bar, and side squeeze buttons to instantly access the [Mac OS X](#) Dashboard or other customizable features. Currently the Mighty Mouse is available in both wired and wireless versions.

Lisa Mouse is the name for the [mouse](#) that was distributed with [Apple's](#) first mouse-controlled computer (pre-Macintosh) in 1983. The Lisa Mouse used a steel ball (instead of the rubber ball found in more modern mice), and was rectangular in shape with a raised front panel, and contained a single mouse button.

A Bus [mouse](#) is connected to a [computer](#) via an [expansion board](#). Another type of mouse was a [serial mouse](#) connected to a [serial port](#). [Serial mice](#) were easier to install, but the advantage of bus mice was that they do not use up the serial port, so you could use the [port](#) for a different [device](#). Bus mice are now obsolete.

Hamster is the name given to a cordless [mouse](#) that operates through an infrared connection.

II. Complete this text about the mouse with verbs from the box:

Click double-click drag grab select move control
--

A mouse allows you to (1)____the cursor and move around the screen very quickly. Making the same movements with the arrow keys on the keyboard would take much longer. As you (2)____the mouse on your desk, the pointer on the screen moves in the same direction. The pointer usually looks like an I-bar, an arrow, or a pointing hand, depending on what you are doing.

A mouse has one or more buttons to communicate with the computer. For example, if you want to place the insertion point or choose a menu option, you just (3)____(press and release) on the mouse button, and the option is chosen.

The mouse is also used to (4)____text and items on the screen. You can highlight text to be deleted, copied or edited in some way.

The mouse is widely used in graphics and design. When you want to move an image, you position the pointer on the object you want to move, press the mouse button, and (5)____ the image to a new location on the screen. Similarly, the mouse is used to change the shape of a graphic

object. For example, if you want to convert a square into a rectangle, you (6)_____one corner of the square and stretch it into a rectangle.

The mouse is also used to start a program or open a document: you put the pointer on the file name and (7)_____on the name — that is, you rapidly press and release the mouse button twice.

III. Translate the text in writing.

The mouse, developed by Douglas Englebart of Xerox in the 1960s, is perfectly suited for operations like pointing, drawing, and selecting. Programs that involve picking objects on the screen, choosing entries from menus, or manipulating graphic objects often make extensive use of the mouse.

A typical mouse translates the motion of its underside on a flat surface into cursor movement on the screen. The principle may be mechanical (a roller or ball whose rotation translates into cursor movement) or optical (involving reference to a special gridded pad on which the mouse must be used). A mouse may have one, two, or three buttons. A simple press and release (called a “click”) normally selects an item; a click and hold operation is used for dragging an object around the screen or sometimes for moving down to the next level of a menu structure. For a mouse with fewer buttons, double clicks or clicks combined with keystrokes are often used to extend the range of operations that can be performed.

A mouse may either be connected to the rest of the computer through a serial port (serial mouse) or else have its own interface card and connector, which hooks directly onto the system bus (bus mouse). It often requires a device driver that must be loaded at system start-up.

Lesson 4. Touch screen

I. Read and translate the text.

The touch screen is, in a sense, the ultimate in simplicity for the computer user: touch the screen with your finger and something happens. As with the bit pad, different regions of the screen are assigned to different actions and are visually indicated by shape, colour, and text. The visitor information systems at Epcot (**Experimental Prototype Community of Tomorrow**) theme park at Walt Disney World Resort use touch screens.

The principle of the touch screen is electrical; the screen is fabricated with conductive and insulating layers in such a way that when a human

finger presses on the screen (which is slightly deformable), an electrical connection is made. Making the screen sensitive to pressure rather than simply to touch improves its robustness under dirty conditions whether industrial grime or chocolate sauce on children's hands. One problem with the touch screen is that the human finger is a rather imprecise pointing device compared to a light pen or mouse. This limits the number of choices that can be displayed on a normal-sized computer screen at one time and forces the programmer to deal with questions concerning what happens if someone presses partly inside and partly outside a region. These problems have limited touch screen applications in industry.

II. Answer these questions.

1. What is a touch screen? 2. What is the principle of a touch screen? 3. Why is the screen made sensitive to pressure and not to touch? 4. What is the problem with the screen touch? 5. Why are touch screen applications limited?

III. Speak on the principle of the touch screen.

Lesson 5. Scanner

I. Before reading the text discuss how many ways there are of capturing an image on a computer.

II. Read the text and see how many things from your list are mentioned.

III. Read the text again and answer these questions.

1. Which device is used to input text and graphic images from a printed page?
2. How does a scanner send information to the computer?
3. Why is text scanning difficult?
4. In addition to flatbed (or desktop) scanners there are also handheld scanners, drum scanners, film ("slide" or negative) scanners and camera scanners. Do you know what they are used for?

A more recent and more widely applicable method of entering graphical information into computers is the optical scanner. A scanner takes a black and white paper original and represents it as a set of ones and zeros that correspond to little black and white squares. This kind of image is often called bit-mapped, since the information in the drawing has been "mapped" into a sequence of black and white squares or binary bits. A

scanner “sees” images and converts the printed text or pictures into electronic codes that can be understood by the computer. With a flatbed colour scanner, the paper with the images is placed face down on a glass screen, as with a photocopier. Beneath the glass are the lighting and measurement devices. Once the scanner is activated, it reads the image as a series of dots and then generates the digitized image that is sent to the computer and stored as a file.

The scanner operates by using three rotating lamps, each of which has a different coloured filter: red, green and blue. The resulting three separate images are combined into one by appropriate software.

A difficulty with scanning technology is that the resulting image takes up a great deal of disk space if high resolution is desired. Text scanning is even more difficult, since the computer not only has to read in the image but must also decide whether the shape it is seeing is an A, a B, or whatever. Different types of fonts or poor quality printing sharply reduce the performance of text scanners, but the technology is developing.

IV. Complete the following sentences.

1. The technology used in scanners is similar to that used in a ____.
2. The scanned image is sent to the ____, where you can manipulate it.
3. To scan the text, you need special ____.
4. Flatbed scanners can scan ____.

V. What other ways of capturing an image on a computer do you know?

VI. What does a digital camera do?

VII. What does the term “camcoder” stand for? What does a camcoder do?

VIII. What do you know about web cameras (webcams)?

Lesson 6. Output devices

I. Before reading the text try to answer these questions.

1. What types of displays do you know?
2. How can you change the picture using the controls?
3. Can you watch TV on your PC monitor?

II. Complete these definitions with words from the box. Then read the text and check your answers.

Resolution	pixel	aspect ratio	colour depth	video adapter
plasma screen				

1. _____ – the smallest unit on a display screen or bitmapped image (usually a coloured dot)
2. _____ – an expansion card that generates the video signal sent to a computer display
3. _____ – the width of the screen in proportion to its height
4. _____ – also called *gas discharge display*
5. _____ – the number of pixels contained in a display, horizontally and vertically
6. _____ – the number of bits used to hold a colour pixel; this determines the maximum number of colours that can be displayed

III. Read the text again and answer these questions.

1. What do CRT and LCD stand for?
2. How is the screen size measured?
3. What technology is used in active-matrix LCDs?
4. What unit of frequency is used to measure the brightness of a display?
5. What substance produces light and colour when hit by electrons in a CRT monitor?

Displays, often called monitors or screens, are the most-used output device on a computer. They provide instant feedback by showing text and graphic images.

The monitor or screen is the computer's usual means of communicating with the user. The term "monitor" probably comes from the fact that the user monitors, or keeps track of, what the computer is doing by watching the display on the screen. Screens vary in size, resolution, colour and graphics capabilities, and the technology used to produce the screen image.

Resolution refers to the number of dots of colour, known as pixels (picture elements), contained in a display. It is expressed by identifying the number of pixels on the horizontal and vertical axes.

The size of display is described by the aspect ratio and the screen size. Historically, computer displays, like most televisions, have had an aspect ratio of 4:3 – the width of the screen to the height is four to three. For widescreen LCDs, the aspect ratio is 16:9.

Inside the computer there is a video adapter, or graphics card, which processes images and sends signals to the monitor. CTR monitors use VGA (video graphics adapter) cable, which converts digital signals into analogue signals. LCDs use a DVI (digital video interface) connection.

Colour depth refers to the number of colours a monitor can display. This depends on the number of bits used to describe the colour of a single pixel.

Most desktop displays use Cathode Ray Tube (CRT) or Liquid Crystal Display (LCD) technology, while portable computing devices incorporate LCDs.

The CRT is the oldest and most commonly used display technology in the computer world. The principle of operation is similar to a television set in that a tube similar to a picture tube projects dots of coloured light onto different parts of the screen to form letters and other images. However, the process by which information is transferred from computer memory to a screen image is different from the reconstruction of a television picture from a broadcast signal, as will be explained shortly.

Monochrome (one colour) monitors display either one colour (most commonly yellow, green, or white) on a black background, or else black on a white background. The colour is determined by the chemical makeup of the phosphor, a substance that coats the inner surface of the CRT and generates the display by glowing when excited by light.

Colour monitors have three phosphor dots for each point (or pixel, for a picture cell) on the screen that can be activated by the scanning beam. Each of these dots will glow red, blue, or green when excited by light. Since these are the three light primaries, other colours can be produced by exciting more than one of the dots for a given pixel. More shades of colour can be generated if the intensity of the dots can be varied.

As in a television set, the phosphor dots are activated by a light beam that scans the screen in horizontal lines, moving from top to bottom. Scan time or refresh rate is a measure of how long the beam takes to make a complete pass over the screen. Scan time is important because the excited phosphor dots stay bright for only a limited time (this time is called the “persistence” of the phosphor). Display quality therefore involves matching the scan time with the characteristics of the phosphor. If the scan is too slow for the phosphor, the display will flicker because some phosphor dots will have a chance to grow visibly dim before the beam comes back to recharge them. A high-persistence phosphor, however, will leave a “ghost” image on the screen for a noticeable time after the light stimulus is removed. The faster scanning needed with a low-persistence phosphor is

more expensive because the electronics and control circuitry for the beam must have a faster response time.

When a computer must be small or portable, CRT technology becomes difficult to implement. The tube cannot be compressed front to back beyond a certain point without compromising image quality (as the scanning beam must move through a wider angle, the dots near the edge become elliptical instead of circular). Moreover, CRTs are highly subject to impact damage or breakage. Therefore, many portable computers use LCD technology instead.

LCDs are widely used in calculators, digital watches, and instruments as well as in computers. The screen consists of a sheet of crystalline material sandwiched between two sheets of glass. The crystals can assume two shapes: one when excited by an energy input, the other when unexcited. In their unexcited state, the crystals reflect most of the incident light and appear pale grey; when excited, they absorb light and appear black.

One advantage of LCDs is that the amount of energy required to make the crystals change shape is much less than that needed to turn on a dot on a CRT phosphor display. The lesser energy input, however, plus the fact that the LCD is merely reflecting or absorbing the ambient light rather than itself emitting light, means that LCDs can suffer from poor contrast, especially in marginal lighting conditions or when viewed at an angle. More recent designs use improved crystals or backlighting to obtain more contrast.

Active-matrix LCDs use TFT (thin film transistor) technology, in which each pixel has its own switch. The amount of light the LCD monitor produces is called brightness or luminance, measured in cd/m^2 (candela per square meter).

UNIT 5. BASIC SOFTWARE

Lesson 1. What is an operating system (OS)?

I. Before reading the text discuss these questions.

1. How many operating systems can you think of? Make a list.
2. What is the function of an operating system?

II. Read the text. Prepare a list of 8-10 questions to ask about the text. Get ready to interview the students in your group.

Not all computers have operating systems. The computer that controls the microwave oven in your kitchen, for example, doesn't need an operating system. It has one set of tasks to perform, very straightforward input to expect (a numbered keypad and a few pre-set buttons) and simple, never-changing hardware to control. For a computer like this, an operating system would be unnecessary baggage, driving up the development and manufacturing costs significantly and adding complexity where none is required. Instead, the computer in a microwave oven simply runs a single hard-wired program all the time.

All desktop computers have operating systems. The most common are the Windows family of operating systems developed by Microsoft, the Macintosh operating systems developed by Apple and the UNIX family of operating systems (which have been developed by a whole history of individuals, corporations and collaborators). There are hundreds of other operating systems available for special-purpose applications, including specializations for mainframes, robotics, manufacturing, real-time control systems and so on.

In any device that has an operating system, there's usually a way to make changes to how the device works. This is far from a happy accident; one of the reasons operating systems are made out of portable code rather than permanent physical circuits is so that they can be changed or modified without having to scrap the whole device.

For a desktop computer user, this means you can add a new security update, system patch, new application or even an entirely new operating system rather than junk your computer and start again with a new one when you need to make a change. As long as you understand how an operating system works and how to get at it, in many cases you can change some of the ways it behaves. The same thing goes for your phone, too.

III. Give examples of the following words or phrases in the sentences of your own:

desktop computer, operating systems, set of tasks, any device, special-purpose applications.

IV. Provide the main idea of the text in 3-5 sentences.

Lesson 2. A computer operating system

I. Before reading the following text, look at the words below. How many of them do you know? How many of them could you guess?

card slot — гнездо для платы
distributed — распределенные
interact — взаимодействовать
backbone — (зд.) магистраль сети
managing — координирующая
allocation of memory — распределение памяти
commonly — часто, в большинстве случаев
liaison — связь взаимодействия
efficiently — рационально
tools — инструментарий
interpreter — преобразователь данных
linker — компоновщик, редактор связи
debugger — программа отладки
to merge — объединять
bundle — связка
to accomplish — выполнять
application suite — прикладной программный комплекс (напр., Microsoft Office)
spreadsheet — крупноформатная (электронная) таблица
template — шаблон
simulation — имитационное моделирование

II. Read and translate the text.

A collection of computer programs, procedures and documentation that perform specific tasks on a computer system as desired by the user is known as Computer Software. Examples include application software such as word processors, which perform productive tasks for users, and system software.

They interact with the hardware to provide the necessary services for application software and middle ware that controls and coordinates distributed systems. Software also includes websites, programs, video games, etc that are coded by programming languages like C, HTML, Java, PHP, etc. An operating system is a program designed to run other programs on a computer. A computer operating system is its most important software. It is considered the backbone of a computer, managing both software and hardware resources. Operating systems are responsible for everything from the control and allocation of memory to recognizing input from external devices and transmitting output to computer displays. They also manage files on computer hard drives and control peripherals, like

printers and scanners. Commonly used operating systems for IBM compatible personal computers include Microsoft Windows, Linux, and UNIX variations. For Macintosh computers, Mac OS X, Linux, BSD, and some Windows variants are commonly used. Device driver software is small files that act like liaisons between hardware in a computer system and the operating system (OS). Hardware requires device drivers so that the OS can see the devices and handle them effectively and efficiently. Common components that require drivers include keyboards, mice, controllers, graphics cards, audio hardware, wireless cards, ports, card readers, card slots and CD/DVD drives. Multiple applications bundled together as a package are sometimes referred to as an application suite. Microsoft Office, Open Office org, and work 08, which bundle together a word processor, a spreadsheet, and several other discrete applications, are typical examples. User written software tailors systems to meet the users' specific needs. User written software includes spreadsheet templates, word processor macros, scientific simulations, and graphics and animation scripts. Even email filters are a kind of user software. Users create this software themselves.

III. Give the Russian equivalents for the following expressions.

Business software, computer hard drives, productive tasks, distributed systems, device driver software, an advanced graphical user interface, scientific simulations, email filters, animation scripts, a software bundle, common components, middle ware.

IV. Pick out from the text all the word combinations with the following words (terms) and give their Russian equivalents:

Programming; computer; software; user; system; device; task.

V. Match the following English expressions (A-L) and their Russian equivalents (1-12):

A input peripherals	1. аппаратное моделирование
B hardware compatible	2. эффективно использовать ресурсы
C to use resources effectively	3. макрооперация, определенная пользователем
D software tools	4. периферийные устройства ввода
E graphics editor	5. (стандартный) блок

<i>F</i> debugging compiler	испытательной программы
<i>G</i> educational software	6. периферийные устройства вывода
<i>H</i> antivirus package	7. программа редактирования графической информации
<i>I</i> test program template	8. отладочный компилятор
<i>J</i> output peripherals	9. аппаратно-совместимый
<i>K</i> user-defined macros	10. программные средства
	11. обучающее программное обеспечение
<i>L</i> hardware simulation	12. антивирусный пакет программ

VI. Sum up the contents of the text by answering the following questions:

1. What is OS? 2. What is it responsible for? 3. What operating system do you know? 4. What acts like liaisons between hardware in a computer system and the operating system? 5. What is the function of device driver software? 6. What for does hardware require device drivers? 7. What OS are used for personal computers? 8. What tools are provided by programming software? 9. What do typical applications include? 10. What is an application suite? 11. What does user written software include?

VII. Read the text and do the assignments after it.

What is Linux and why is it so popular?

Linux is an operating system (very much like UNIX) that has become very popular over the last several years.

Linux is as much a phenomenon as it is an operating system. To understand why Linux has become so popular, it is helpful to know a little bit about its history. The first version of UNIX was originally developed several decades ago and was used primarily as a research operating system in universities. High-powered desktop workstations from companies like Sun proliferated in the 1980s, and they were all based on UNIX. A number of companies entered the workstation field to compete against Sun: HP, IBM, Silicon Graphics, Apollo, etc. Unfortunately, each one had its own version of UNIX and this made the sale of software difficult. Windows NT was Microsoft's answer to this marketplace. NT provides the same sort of features as UNIX operating systems — security, support for multiple

CPUs, large-scale memory and disk management, etc. — but it does it in a way that is compatible with most Windows applications.

The entry of Microsoft into the high-end workstation arena created a strange dynamic. The proprietary operating systems owned by separate companies and the lack of a central authority in the UNIX world weaken UNIX, but many people have personal problems with Microsoft. Linux stepped into this odd landscape and captured a lot of attention.

The Linux kernel, created by Linus Torvalds, was made available to the world for free. Torvalds then invited others to add to the kernel provided that they keep their contributions free. Thousands of programmers began working to enhance Linux, and the operating system grew rapidly. Because it is free and runs on PC platforms, it gained a sizeable audience among hard-core developers very quickly.

In general, Linux is harder to manage than something like Windows, but offers more flexibility and configuration options.

Notes

Workstation — сетевой компьютер, использующий ресурсы сервера; *to proliferate* — распространять; *high-end* — мощный, профессиональный, высококачественный; высокого класса; с широкими функциональными возможностями.

1. Say what you have learnt from the text about Linux as an operating system.
2. Translate the 2-nd paragraph in writing.
3. Select the topical sentences in each paragraph of the text.
4. Summarise the text.

VIII. Read and translate the text. Do the assignments following it.

How Windows Vista works

The first version of Microsoft Windows hit the market in 1983. But unlike today's versions of Windows, Windows 1.0 was not an operating system. It was a graphical user interface that worked with an existing OS called MS-DOS. Version 1.0 didn't look much like newer versions, either — not even Windows 3.0, which many people think of as the first real version of Windows. Its graphics were simpler and used fewer colours than today's user interfaces, and its windows could not overlap.

Windows has changed considerably since then. In the last 20 years, Microsoft has released numerous full-fledged versions of the operating system. Sometimes, newer versions are significantly different from older ones, such as the change from Windows 3.1 to Windows 95. Other new

releases have seemed more like enhancements or refinements of the older ones, such as the multiple consumer versions of the OS released from 1995 to 2001.

Microsoft's newest version of its operating system is Windows Vista. For many users, upgrading to Vista won't seem as dramatic as the upgrade from 3.1 to Windows 95. But Windows Vista has a number of new features, both in the parts that you can see and the parts that you can't.

At its core, Windows Vista is still an operating system. It has two primary behind-the-scenes jobs:

- Managing hardware and software resources, including the processor, memory, storage and additional devices.

- Allowing programs to work with the computer's hardware.

If all goes well, this work is usually invisible to the user, but it's essential to the computer's operation.

Notes

full-fledged — окончательно готовый, полностью отработанный (напр., о разработанной системе программного обеспечения); *enhancement* — модернизация; совершенствование; расширение (напр., возможностей программных средств); *behind-the-scenes* — негласный

1. Say what you have learnt from the text about Windows Vista.
2. Ask your group-mates 10 questions on the text.
3. Select the topical sentences in each paragraph of the text.
4. Retell the text.

IX. Read and translate the text.

GUI operating systems

The term "user interface" refers to the standard procedures that the user follows in order to interact with a computer. In the late 1970s and early 80s, the way users accessed computer systems was very complex. They had to memorize and type a lot of commands just to see the contents of a disk, to copy files or to respond to a single prompt. In fact, it was only experts who used computers, so there was no need for a user-friendly interface.

When computers were first introduced in the 1940s and 50s, every program written had to provide instructions that told the computer how to use devices such as the printer, how to store information on a disk, as well as how to perform several other tasks not necessarily related to the program. The additional program instructions for working with hardware devices were very complex, and time-consuming. Programmers soon

realized it would be smarter to develop one program that could control the computer's hardware, which other programs could have used when they needed it. With that, the first operating system was born.

Today, operating systems control and manage the use of hardware devices such as the printer or mouse. They also provide disk management by letting you store information in files. The operating system also lets you run programs such as the basic word processor. Lastly, the operating system provides several of its own commands that help you to use the computer.

DOS is the most commonly used PC operating system. DOS is an abbreviation for disk operating system. DOS was developed by a company named Microsoft. MS-DOS is an abbreviation for "Microsoft DOS". When IBM first released the IBM PC in 1981, IBM licensed DOS from Microsoft for use on the PC and called it PC-DOS. From the users' perspective, PC-DOS and MS-DOS are the same, each providing the same capabilities and commands.

The version of DOS release in 1981 was 1.0. Over the past decade, DOS has undergone several changes. Each time the DOS developers release a new version, they increase the version number.

Windows NT (new technology) is an operating system developed by Microsoft. NT is an enhanced version of the popular Microsoft Windows 3.0, 3.1 programs. NT requires a 386 processor or greater and 8 Mb of RAM. For the best NT performance, you have to use a 486 processor with about 16 Mb or higher. Unlike the Windows, which runs on top of DOS, Windows NT is an operating system itself. However, NT is DOS compatible. The advantage of using NT over Windows is that NT makes better use of the PC's memory management capabilities.

OS/2 is a PC operating system created by IBM. Like NT, OS/2 is DOS compatible and provides a graphical user interface that lets you run programs with a click of a mouse. Also like NT, OS/2 performs best when you are using a powerful system. Many IBM-based PCs are shipped with OS/2 preinstalled.

In 1984, Apple produced the Macintosh, the first computer with a mouse and a graphical user interface (GUI). Macs were designed with one clear aim: to facilitate interaction with the computer. A few years later, Microsoft launched Windows, another operating system based on graphics and intuitive tools. Nowadays, computers are used by all kinds of people, and as a result there is a growing emphasis on accessibility and user-friendly systems.

A GUI makes use of a WIMP environment: **w**indows, **i**cons, **m**enus and **p**ointer. The background of the screen is called the desktop, which contains labeled pictures and icons. These icons represent files or folders. Double-clicking a folder opens a window which contains programs, documents, or more nested folders. When in folder, a user can launch a program or document by double-clicking the icon, or drag it to another location. When running a program PC opens a window that lets one work with different tools. All the programs have a high level of consistency, with similar toolbars, menu bars, buttons and dialogue boxes. A modern OS also provides access to networks and allows multitasking, which means running several programs — and do various tasks — at the same time.

The most popular operating systems are:

- The Windows family — designed by Microsoft and used on most PCs. The most recent version is Windows Vista.
- Mac OS — created by Apple and used on Macintosh computers.
- Unix — a multi-user system, found on mainframes and workstations in corporate installations.
- Linux — open-source software developed under the GNU General public License. This means anybody can copy its source code, change it and distribute. It is used in computers, appliances and small devices.
- Windows Mobile — used on most PDAs and smartphones (PDAs incorporating mobile phones).
- Palm OS — used on Palm handed devices.
- RIM — used on BlackBerry communication devices. Developed by Research In Motion.
- The Symbian OS — used by some phone makers, including Nokia and Siemens.

These computer platforms differ in areas such as device installation, network connectivity or compatibility with application software.

X. Translate these terms into Russian. Use the dictionary or the Internet to help you.

User interface, procedure, tools, desktop, nested folders, launch a program, source code.

XI. Read the text again and decide which adjectives in the list describe a GUI best.

User-friendly; slow; accessible; text-based; intuitive; complex; graphics-based.

XII. Answer the questions.

1. What kind of OS was used in the early 80s: text-based or graphics-based? 2. What was the contribution of Macintosh computers to the development of graphic environments? 3. What does acronym WIMP stand for? 4. How do you run a program on a computer with a graphical interface? 5. What is multitasking? 6. Which multi-user OS is used on large, powerful computers? 7. What is the benefit of using open-source software, for example Linux? 8. Which Macintosh platform is used for pocket PCs, mobiles and portable media centers? 9. What does user-friendly mean? 10. Do you think most OS are user-friendly? Give your reasons.

Lesson 3. Software

I. Read and memorize the following words and word combinations:

to distinguish — отличать, различать, выделять, проводить различие

to encompass — охватывать, включать, заключать (в себе)

to signify — выражать, показывать, означать, быть признаком

to insulate — отделять, обособлять

to precede — предшествовать, предварять

to blur — делать неясным, затуманивать

to accomplish — совершать, выполнять, исполнять

arbitrary — условный, случайный, произвольный

accessory — дополнительный, вспомогательный, сопутствующий

feature — признак, черта, свойство, особенность, характеристика

debugger — программа отладки

ordered sequence of instructions — упорядоченная последовательность инструкций

II. Read and translate the text.

Computer software or just software is a general term used to describe a collection of computer programs, procedures and documentation that perform some tasks on a computer system. Software includes websites, programs, video games etc. that are coded by programming languages like C, C++, etc. “Software” is sometimes used in a broader context to mean anything which is not hardware but which is used with hardware, such as film, tapes and records.

Computer software is so called to distinguish it from computer hardware, which encompasses the physical interconnections and devices required to store and execute (or run) the software. At the lowest level, software consists of a machine language specific to an individual processor. A machine language consists of groups of binary values signifying processor instructions which change the state of the computer from its preceding state. Software is an ordered sequence of instructions for changing the state of the computer hardware in a particular sequence. It is usually written in high-level programming languages that are easier and more efficient for humans to use (closer to natural language) than machine language. High-level languages are compiled or interpreted into machine language object code.

Practical computer systems divide software systems into three major classes: system software, programming software and application software, although the distinction is arbitrary, and often blurred.

System software helps run the computer hardware and computer system. It includes: device drivers, diagnostic tools, operating systems, servers, utilities, windowing systems. The purpose of systems software is to insulate the applications programmer as much as possible from the details of the particular computer complex being used, especially memory and other hardware features, and such accessory devices as communications, printers, readers, displays, keyboards, etc.

Programming software usually provides tools to assist a programmer in writing computer programs, and software using different programming languages in a more convenient way. The tools include: compilers, debuggers, interpreters, linkers, text editors.

Application software allows end users to accomplish one or more specific (non-computer related) tasks. Typical applications include: industrial automation, business software, computer games, databases, educational software, medical software and etc. Businesses are probably the biggest users of application software, but almost every field of human activity now uses some form of application software.

Notes

System software – системное программное обеспечение (в отличие от прикладного); *programming software* – программное обеспечение для программирования; *application software* – прикладная программа; прикладное программное обеспечение; программа специального применения; *utility* – утилита (сервисная программа, обслуживающая программа, облегчающая работу с компьютером или пользование какими-либо другими программами)

III. Give the Russian equivalents.

To be used in a broader context; to distinguish from; to encompass the physical interconnections; to store and execute (or run); software preceding state; as much as possible; to insulate from; hardware features; accessory devices; to assist a programmer; groups of binary values; ordered sequence of instructions; high-level programming languages; closer to natural language; system software; programming software; application software; device drivers; diagnostic tools.

IV. Give the English equivalent.

Программное обеспечение для программирования; прикладная программа; вспомогательные устройства; делать неясным; системное программное обеспечение; упорядоченная последовательность инструкций; произвольный; отличать от; характеристика; программа отладки; предшествующий; компилятор; текстовый редактор; выполнять некоторые задачи; заключать (в себе).

V. Fill in the blanks with the appropriate form from the box.

To divide, to be used, to be written; to be coded, to encompass, to provide

1. It ____ to describe a collection of computer programs. 2. These applications ____ industrial automation, business software, educational software, medical software and etc. 3. Computer systems ____ software systems into three major classes. 4. Programming software usually ____ tools to assist a programmer in writing computer programs. 5. Programs, video games ____ by programming languages. 6. Software usually ____ in high-level programming languages.

VI. Answer the following questions.

1. What is computer software? 2. What does software encompass? 3. What does hardware include? 4. What are high level languages oriented to? 5. What major classes are software systems divided into? Characterize them shortly.

VII. Give a brief summary of the above text.

Lesson 4. Software engineering

1. Pronounce the following words and word-combinations, try to memorize them. You'll come across these words while reading the text.

debugging — нахождение и устранение дефектов
maintaining — поддержание
to exhibit — показывать
desired — требуемый
customization — настройка
application domain — область применения
numeric value — числовое значение
preference — предпочтение
consideration — обсуждение
availability — наличие
trade-offs — компромисс
property — свойство, качество
relevant — соответствующий
efficiency — эффективность, КПД
reliability — надежность
consumption — потребление
to imply — означать
error propagation — распространение ошибки
prevention — предотвращение
overflow — переполнение
underflow — исчезновение (значащих) разрядов, потеря значимости; опустошение (напр., буфера данных при обмене)
zero division — деление на ноль
robustness — запас прочности
portability — мобильность
to anticipate — предупреждать
incompatibilities — несовместимость
readability — удобочитаемость
variable — переменная

II. Read and translate the text.

Computer programming is the process of writing, testing, debugging/troubleshooting, and maintaining the **source code** of **computer programs**. This source code is written in a **programming language**. The code may be a modification of an existing source or something completely new, the purpose being to create a program that exhibits a certain desired behavior (customization). The process of writing source codes requires

expertise in many different subjects, including knowledge of the application domain, specialized [algorithms](#), and [formal logic](#).

Within [software engineering](#), programming is regarded as one phase in a [software development process](#).

In some specialist applications or extreme situations a program may be written or modified (known as patching) by directly storing the numeric values of the [machine code](#) instructions to be executed into memory.

There is an ongoing debate on the extent to which the writing of programs is an art, a craft or an engineering discipline. Good programming is generally considered to be the measured application of all three, with the goal of producing an efficient and maintainable software solution (the criteria for “efficient” and “maintainable” vary considerably). The discipline differs from many other technical professions in that programmers generally do not need to be licensed or pass any standardized (or governmentally regulated) certification tests in order to call themselves “programmers” or even “software engineers”.

Another ongoing debate is the extent to which the programming language used in writing programs affects the form that the final program takes.

Different programming languages support different styles of programming (called [programming paradigms](#)). The choice of language used is subject to many considerations, such as company policy, suitability to task or individual preference. Ideally, the programming language best suited for the task at hand will be selected. Trade-offs from this ideal involve finding enough programmers who know the language to build a team, the availability of [compilers](#) for that language, and the efficiency with which programs written in a given language execute.

Allen Downey, in his book *How To Think Like A Computer Scientist* wrote:

“The details look different in different languages, but a few basic instructions appear in just about every language. Input: Get data from the keyboard, a file, or some other device. Output: Display data on the screen or send data to a file or other device. Math: Perform basic mathematical operations like addition and multiplication. Conditional execution: Check for certain conditions and execute the appropriate sequence of statements. Repetition: Perform some action repeatedly, usually with some variation.”

Although quality programming can be achieved [in a number of ways](#), following five properties are among the most relevant:

Efficiency/ performance: it is referred to the system resource consumption (computer processor, memory, slow devices, networks and to some extent even user interaction) which must be the lowest possible.

Reliability: the results of the program must be correct, which not only implies a correct code implementation but also reduction of **error propagation** (e.g. resulting from data conversion) and prevention of typical errors (overflow, underflow or zero division).

Robustness: a program must anticipate situations of data type conflict and all other incompatibilities which result in run time errors and break the program. The focus of this aspect is the interaction with the user and the handling of error messages.

Portability: it should work as it is in any software and hardware environment, or at least without relevant reprogramming.

Readability: the purpose of the main program and of each subroutine must be clearly defined with appropriate comments and self explanatory choice of symbolic names (constants, variables, function names, classes, and methods).

Notes

efficiency/ performance – эффективность, практичность программы;
robustness – выносливость (к нежелательным, но возможным воздействиям);
робастность; *portability* – взаимозаменяемость, мобильность, переносимость;
buffer overflows/underflows – переполнение приёмного буфера/ отрицательное переполнение буфера

III. Sort out all international words from the text and translate them.

IV. Turn the verbs into nouns using the suffix –tion and translate into Russian:

To operate – operation, to execute, to implement, to prevent, to propagate, to consume, to instruct, to add, to multiply, to vary, to apply, to reduce, to modify, customize.

V. Turn the verbs into gerunds using -ing and translate them into Russian:

to write – writing, to program, to code, to test, to produce, to handle, to reprogram.

VI. Translate Allen Downey's statement from his book in writing.

VII. Answer the following questions.

1. What is computer programming? 2. What is written in a programming language? 3. What field of knowledge does the process of writing source codes require expertise in? 4. What debates are mentioned in the text? 5. What does the choice of programming language depend on? 6. How many fundamental properties must the program finally satisfy? 7. Can you add your own quality requirements?

VIII. Match phrases (1-5) to (A-E) to make up sentences.

1. The process of writing source codes requires...	A ____ the goal of producing an efficient and maintainable software solution.
2. A program may be written...	B ____ different styles of programming.
3. Good programming has...	C ____ in a number of ways
4. Different programming languages support...	D ____ expertise in many different subjects.
5. Quality programming can be achieved...	E ____ by directly storing the numeric values of the machine code instructions.

IX. Choose the proper word for the sentences given below.

<i>Suitability relevant reduction craft considerations</i>
--

1. The choice of fundamental directions was the subject to many ____.
 2. Many decisions will depend on our company policy and ____ to many requirements.
 3. Good programming is considered to be the measured application of an art ____ and an engineering discipline.
 4. The purpose of this program is ____ of typical errors.
 5. Chosen qualities requirements will be the most ____ in that situation.

UNIT 6. PROGRAMMING

Lesson 1. From the history of programming

I. Read and translate the text.

The concept of devices that operate following a pre-defined set of instructions traces back to Greek Mythology, notably Hephaestus and his mechanical servants. The Antikythera mechanism was a calculator utilizing gears of various sizes and configuration to determine its operation. The earliest known programmable machines (machines whose behavior can be controlled and predicted with a set of instructions) were Al-Jazari's programmable Automata in 1206. One of Al-Jazari's robots was originally a boat with four automatic musicians that floated on a lake to entertain guests at royal drinking parties. Programming this mechanism's behavior meant placing pegs and cams into a wooden drum at specific locations. These would then bump into little levers that operate a percussion instrument. The output of this device was a small drummer playing various rhythms and drum patterns. Another sophisticated programmable machine by Al-Jazari was the castle clock, notable for its concept of variables which the operator could manipulate as necessary (i.e. the length of day and night).

The Jacquard Loom, which Joseph Marie Jacquard developed in 1801, uses a series of pasteboard cards with holes punched in them. The hole pattern represented the pattern that the loom had to follow in weaving cloth. The loom could produce entirely different weaves using different sets of cards. Charles Babbage adopted the use of punched cards around 1830 to control his Analytical Engine. The synthesis of numerical calculation, predetermined operation and output, along with a way to organize and input instructions in a manner relatively easy for humans to conceive and produce, led to the modern development of computer programming.

Development of computer programming accelerated through the Industrial Revolution. The punch card innovation was later refined by Herman Hollerith who, in 1896 founded the Tabulating Machine Company (which became IBM). He invented the Hollerith punched card, the card reader, and the key punch machine. These inventions were the foundation of the modern information processing industry. The addition of a plug-board to his 1906 Type I Tabulator allowed it to do different jobs without having to be physically rebuilt. By the late 1940s there were a variety of plug-board programmable machines, called unit record equipment, to perform data processing tasks (card reading). Early computer programmers used plug-boards for the variety of complex calculations requested of the newly invented machines.

Notes

Hephaestus — бог огня; Гефест; *Antikythera* — Антикитерский механизм — механическое устройство, обнаруженное в 1900 году на затонувшем древнем судне недалеко от греческого острова Антикитера. *Al-*

Jazari — Аль-Джазари (1136—1202) — исламский инженер, изобретатель, он изобрел коленчатый вал, по его чертежам строились двухтактные клапанные насосы, дамбы и водоподъемные машины. Аль-Джазари сконструировал водяные часы, отбивавшие время каждые полчаса, фонтаны, музыкальные автоматы и т.д. *Joseph Marie Jacquard* — Жозеф Мари Жаккар — французский изобретатель ткацкого станка для узорчатых материй (машина Жаккарда); *Herman Hollerith* — Герман Холлерит — создатель электрической табулирующей системы, основатель компании Tabulating Machine Company; *Charles Babbage* — Чарльз Бэббидж — английский изобретатель, разработал проект первого автоматического вычислителя.

II. Give a list of the main stages in the history of programming.

III. Render the text in English and in Russian. Provide additional information if possible.

Lesson 2. Coding and programming

I. Read and memorize the following words and word combinations:

to convert into — превращать

to maintain — поддерживать, сохранять

to exhibit — показывать, демонстрировать

to execute — осуществлять, выполнять, реализовать

to omit — пропускать, не включать, пренебрегать (чем-л.),
упускать (что-л.)

to be referred to as — именовать, называться

expertise — квалификация, компетентность, компетенция,
мастерство, умение

reference — ссылка, зд. адрес, номер (ячейки)

II. Read and translate the text.

Computer programming (often shortened to programming or coding) is the process of writing, testing, debugging/troubleshooting, and maintaining the source code of computer programs. This source code is written in a programming language. The code may be a modification of an existing source or something completely new. The purpose of programming is to create a program that exhibits a certain desired behavior (customization). The process of writing source code requires expertise in many different subjects, including knowledge of the application domain, specialized algorithms and formal logic.

Computer source code is often written by professional computer programmers. Source code is written in a programming language and may

be converted into an executable file (sometimes called an executable program or a binary) by a compiler. Compiled computer programs are commonly referred to as executables, binary images, or simply as binaries — a reference to the binary file format used to store the executable code. Compilers are used to translate source code from a programming language into either object code or machine code. Object code needs further processing to become machine code and machine code is the Central Processing Unit's native code, ready for execution. Alternatively, computer programs may be executed by a CPU with the aid of an interpreter. The main disadvantage of interpreters is computer programs run slower than if compiled. Interpreting code is slower than running the compiled version because the interpreter must decode each statement each time it is loaded and then perform the desired action. On the other hand, software development may be quicker using an interpreter because testing is immediate when the compilation step is omitted. Another disadvantage of interpreters is that the interpreter must be present on the computer at the time the computer program is executed. By contrast, compiled computer programs need not have the compiler present at the time of execution.

Interpreted computer programs are either decoded and then immediately executed or are decoded into some efficient intermediate representation for future execution. BASIC, Perl, and Python are examples of immediately executed computer programs. Alternatively, Java computer programs are compiled ahead of time and stored as a machine independent code called byte code.

Notes

Troubleshooting — поиск неисправности, диагностика, устранение неполадок; *source code* — исходный текст (программы); *application domain* — область применения вычислительной техники, требующая специальных знаний, например ERP-системы, робототехника, экспертные системы и т.д.

Perl (Practical Extraction and Report Language) — язык для практического извлечения данных и составления отчётов, язык Perl свободно распространяемый интерпретируемый язык. Создан Ларри Уоллом (Larry Wall) в 1986 г. Обычно используется для создания динамически генерируемых Web-страниц. Используется также системными администраторами и Web-мастерами для работы и изменения текстов, файлов и процессов.

Python — язык (программирования) Python интерпретируемый полноценный объектно-ориентированный скриптовый ЯВУ, часто применяемый в качестве языка сценариев при написании Интернет-приложений для системного администрирования, доставки веб-контента и т.п. Поддерживается на многих платформах. Создан в конце 1980-х годов голландским программистом Гвидо Ван Россумом.

Customization — настройка или изготовление продукта под требования (технические условия) заказчика; *executable file* — исполнимый (исполняемый) файл, файл с программой или командный файл. В Windows исполнимые файлы имеют расширения имен файлов EXE, COM, BAT или PIF.

III. Give the Russian equivalents.

On the other hand; a modification of an existing source code; to require expertise; to be decoded into some efficient representation; debugging; disadvantage; ahead of time; an executable file; be converted into an executable file; binary images; further processing; interpreted computer programs; application domain.

IV. Give the English equivalents.

Сохранять исходный текст программы; изменение исходного текста; демонстрировать; устранение неполадок; основной недостаток, программа выполняется; пренебрегать (чем-л.); называться; компетентность; ссылка; сохранить в машинном коде; двоичный; изготовление продукта под требования заказчика; бинарные изображения; код ЦПУ.

V. Fill in the blanks with the appropriate grammar form from the box.

To be decoded and executed, to be compiled, to be executed, to require, to write.

1. Interpreted computer programs ____ and then immediately ____.
2. Writing source code ____ expertise in many different subjects.
3. Computer programs may ____ by a CPU with the aid of an interpreter.
4. Java computer programs ____ ahead of time and stored as a machine independent code.
5. Source code ____ in a programming language.

VI. Answer the following questions.

1. What is the purpose of programming?
2. What is coding?
3. What does the process of writing source code require?
4. What are executables?
5. What are compilers used for?
6. What is the main disadvantage of interpreters?

VII. Summarize the information about programming and coding..

VIII. Read and translate the text without a dictionary. Write a short summary of it.

Software quality and reliability

Software quality is very important, especially for commercial and system software like Microsoft Office, Microsoft Windows, Linux, etc. If software is faulty (buggy), it can delete a person's work, crash the computer and do other unexpected things. Faults and errors are called "bugs" and these are eliminated (debugged) through software testing. It is believed that all large programs have some bugs. All major software companies, such as Microsoft, Novell and Sun Microsystems, have their own software testing departments with the specific goal of just testing. Software can be tested through unit testing, regression testing and other methods, which are done manually, or most commonly, automatically, since the amount of code to be tested can be quite large. For instance, NASA has extremely rigorous software testing procedures for its Space Shuttle and other programs because faulty software can crash the whole program and make the vehicle not functional, at great expense.

There are many software companies in the world and selling software can be quite a profitable industry. For instance, Bill Gates, the founder of Microsoft was the second richest man in the world in 2008 largely by selling the Microsoft Windows and Microsoft Office software programs and the same goes for Larry Ellison largely through his Oracle database software.

There are many non-profit software organizations like the Free Software Foundation, GNU Project, Mozilla Foundation. Also there are many software standards organizations like the W3C and others that try to come up with a software standard so that many software can work and interoperate with each other like through standards such as XML, HTML, HTTP, FTP, etc.

Some large software companies include Microsoft, IBM, Oracle.

Notes

Microsoft Office — пакет программных продуктов фирмы Microsoft, включающий текстовые процессоры (Microsoft Word), СУБД (Microsoft Access), электронные таблицы (Microsoft Excel), электронную почту (Microsoft Outlook) и др. *Microsoft Windows* — операционная система, выпущенная компанией Microsoft.

Novell, Sun Microsystems — производители аппаратного и программного обеспечения, а также принадлежащие им торговые марки

NASA — сокр.от National Aeronautics and Space Administration, НАСА..

Oracle — корпорация Oracle, выпускающая мощные системы управления базами данных, а также принадлежащая ей торговая марка.

Free Software Foundation — Фонд бесплатного ПО — организация, занимающаяся разработкой и распространением бесплатного и условно-бесплатного программного обеспечения. Основана Ричардом Столманом (Richard Stallman) в 1983 г.

GNU Project — сокр. от “GNU is Not Unix”, проект по свободному распространению программного обеспечения.

Mozilla — прозвище программы Netscape Navigator

W3C — *WWWC* — *World Wide Web Consortium*

Lesson 3. Stages in programming

I. Read and memorize the following words and word combinations:

precisely — точно

over-all plan — общий план

flow chart — блок-схема

actual coding — текущее кодирование

to detect/ correct errors — выявлять/ исправлять ошибки

to invalidate — сводить на нет

without losing sight — не упуская из вида

variable connector — переменный соединитель

to eliminate — устранять

statement — высказывание

II. Read and translate the text.

There are five stages in programming. First, the computations to be performed must be clearly and precisely defined. The over-all plan of the computations is diagrammed by means of a so called flow chart. The second stage is the actual coding. It is often best to write a code in terms of a symbolic language first, for then changes are easily made. Numbers are assigned to the symbols, and the final code is prepared. In the third stage some procedure is used to get the code into the memory of the computer. The fourth stage consists in debugging the code, i.e. detecting and correcting any errors. The fifth, and the final stage, involves running the code on the computer and tabulating the results. In fact, it is well known that a single error in one instruction invalidates the entire code. Hence, programming is a technique requiring attention to details without losing sight of the over-all plan.

Flow chart is a diagram, or picture, of a code that is often helpful for visualizing interrelationship between various parts of a code. Such a diagram is almost always made before the specific instructions are written. There are essentially three kinds of symbols used in a flow chart (see Fig.

1). The first represents function calculations, the second represents decisions and the various associated alternatives, the third, called a variable connector, is simply a way to eliminate too many crossing lines in the picture or to indicate which lines to follow when one has to continue the diagram on another page.

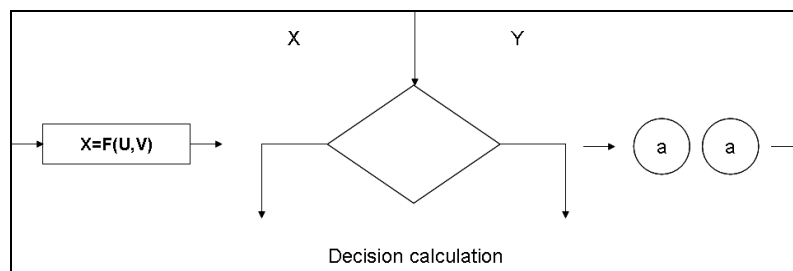


Figure 1. *Flow chart symbols*

Symbolic Coding Aids. It is another intermediate aid between the statement of the problem and the final code. Symbolic coding consists in writing a code not in terms of specific numerical addresses, but rather in terms of some name description or other symbolism to represent the addresses. Then at a later time, specific addresses can be assigned for these symbols, or names, to produce the actual code. The intermediate code in terms of symbols is called the symbolic code. This technique is extremely useful particularly in those cases where one must write instructions involving addresses of constants or of other instructions that have not yet been specially assigned.

Notes

The over-all plan of computations — общий план вычислений; *numbers are assigned to the symbols* — цифрам присваиваются символы; *various associated alternatives* — различные взаимодействующие альтернативы; *symbolic coding aids* — вспомогательные средства символического кодирования; *technique is extremely useful* — технический прием чрезвычайно эффективен.

IV. Give the Russian equivalents.

Programming, computations, the over-all plan, flow chart, numbers, debugging, running the code, tabulating the results, instruction, interrelationship, calculations, decisions, variable connector, intermediate aid, numerical addresses, to write instructions.

V. Give the English equivalents.

Программирование, вычисления, общий план, блок-схема, числа, отладка (программы), прогон программы, сведение результатов в таблицы, команда, соотнесенность, вычисления, решения, переменный соединитель, промежуточная поддержка, числовые адреса, писать команды.

VI. Fill in the blanks the appropriate form of the word-combinations from the box.

To be useful; to represent; to be assigned; to be diagrammed; to be called; to be prepared; to write

1. The over-all plan of computations ____ by means of a so called flow chart. 2. Numbers ____ to the symbols, and the final code _____. 3. The first ____ calculations, decisions and alternatives. 4. The intermediate code in terms of symbols ____ the symbolic code. 5. The technique ____ extremely ____ particularly in those cases where a person must ____ instructions.

VII. Answer the following questions.

1. How many stages are there in programming? 2. What are they? Characterize them. 3. What can we see on the diagram? 4. How many symbols are used in the flow chart? Comment on them. What is the purpose of making diagrams? 5. What do we mean by Symbolic Coding Aids? 6. What is the intermediate code? 7. What is in common between symbolic and intermediate coding? 8. In what cases is symbolic code extremely useful?

VII. Give a brief summary of the above text.

Lesson 4. Programs

I. Read and memorize the following words and word combinations:

to translate programs — переводить программы

to accomplish — выполнять

to schedule — составлять, намечать

resident — резидентная часть программы

common names — общие названия

supervisor — программа-распределитель

execution — выполнение

to sort data — сортировать данные

linkage editor — программа «Редактор связей»

II. Read and translate the text.

The operating system is a collection of programs provided by the manufacturer of computer that allow us to translate symbolic programs into machine code, to schedule the jobs the computer is to perform, and to use the computer effectively.

All symbolic programs must be translated to machine code before their instructions can be understood by the control unit. This translation is accomplished through the use of a program called a language processor.

A control program is an operating system with the purpose of controlling the computer. It schedules the activities of the computer and watches over other programs as they run. In order to be able to control the computer, the control program is a main-memory resident, i.e. it is always in the main memory. Control programs go by different names. Common names for control program are supervisor, monitor, executive or, simply, control program.

Service programs are programs that are used to prepare object programs for execution, to store programs on a magnetic disk, and to sort data recorded on secondary storage devices. The first function is provided by a service program called the linkage editor.

The area on a magnetic disk that is used to hold program is called a library. The service program that adds and deletes programs from the library is the librarian.

A third set of service programs is utilities. They provide a means of copying data from any input device in the system and an easy means of moving data files from one secondary storage device to another. The utilities also may be used to print the contents of a file on the line printer.

In most computers, individual instructions are stored as machine code with each instruction being given a unique number (its operation code or opcode for short). The command to add two numbers together would have one opcode, the command to multiply them would have a different opcode and so on. The simplest computers are able to perform any of a handful of different instructions; the more complex computers have several hundred to choose from — each with a unique numerical code. Since the computer's memory is able to store numbers, it can also store the instruction codes. This leads to the important fact that entire programs (which are just lists of instructions) can be represented as lists of numbers and can themselves be manipulated inside the computer just as if they were numeric data. The fundamental concept of storing programs in the

computer's memory alongside the data they operate on is the crux of the von Neumann, or stored program, architecture. In some cases, a computer might store some or its entire program in memory that is kept separate from the data it operates on. This is called the Harvard architecture after the Harvard Mark I computer. Modern von Neumann computers display some traits of the Harvard architecture in their designs, such as in CPU caches.

While it is possible to write computer programs as long lists of numbers (machine language) and this technique was used with many early computers, it is extremely tedious to do so in practice, especially for complicated programs. Instead, each basic instruction can be given a short name that is indicative of its function and easy to remember — a mnemonic such as ADD, SUB, MULT or JUMP. These mnemonics are collectively known as a computer's assembly language. Converting programs written in assembly language into something the computer can actually understand (machine language) is usually done by a computer program called an assembler. Machine languages and the assembly languages that represent them (collectively termed low-level programming languages) tend to be unique to a particular type of computer. For instance, an ARM architecture computer (such as may be found in a PDA or a hand-held videogame) cannot understand the machine language of an Intel Pentium or the AMD Athlon 64 computer that might be in a PC.

Though considerably easier than in machine language, writing a long program in assembly language is often difficult and error prone. Therefore, most complicated programs are written in more abstract high-level programming languages that are able to express the needs of the computer programmer more conveniently (and thereby help reduce programmer error). High level languages are usually "compiled" into machine language (or sometimes into assembly language and then into machine language) using another computer program called a compiler. Since high level languages are more abstract than assembly language, it is possible to use different compilers to translate the same high level language program into the machine language of many different types of computer. This is part of the means by which software like video games may be made available for different computer architectures such as personal computers and various video game consoles.

Notes

To schedule the jobs the computer is to perform – планировать задания, которые компьютер должен выполнить; *object programs* – конечные программы; *line printer* – линейный принтер; *crux of the von Neumann* - основная проблема фон-неймановской (вычислительной)

архитектуры, основанной на концепции хранимой программы и последовательных вычислений

III. Give the Russian equivalents.

The operating system, collection, to translate symbolic programs, to schedule the jobs, machine code, the control unit, language processor, activities of the computer, main-memory resident, supervisor, control program, service programs, object programs, to store the programs, to sort data, secondary storage devices, linkage editor.

IV. Give the English equivalents.

Операционная система, набор, переводить символьные программы, составлять порядок заданий, машинный код, блок управления, языковой процессор, возможности компьютера, резидентная часть программы основной памяти, программа-распределитель, программа управления, сервисные программы, изучаемые программы, хранить программы, сортировать данные, устройства вторичной памяти, программа «Редактор связей».

V. Fill in the blanks with the appropriate form from the box.

Is used to schedule is called provide must be translated is

1. The operating system ___ a collection of programs. 2. All symbolic programs ___ to machine code. 3. A control program ___ the activities of the computer. 4. They are on a magnetic disk that ___ to hold program ___ a library. 5. Utilities ___ a means of copying data from any input device to any output device in the system.

VI. Answer the following questions.

1. What is the operating system? 2. Why does it exist? 3. Why must all symbolic programs be translated to machine code? 4. What is a control program? 5. What is the purpose of a control program? 6. What are service programs? 7. What do we call a magnetic disc that is used to hold programs? 8. What are utilities? 9. What is the crux of von Neumann architecture? What do you know about the Harvard architecture? 10. What are mnemonics? 11. Why are complicated programs written in abstract high-level languages? 12. What is the purpose of using a compiler? 13. Is it possible to use different compilers?

VII. Speak on the sets of programs comprising the OS..

VIII. Read the text and translate it into Russian without a dictionary. Write a short summary of it.

Program errors

So long as computers are programmed by human beings, computer programs will be subject to errors. It is programmer's responsibility to find errors and correct them. The process of finding and correcting errors or bugs as they are often referred to is called testing and debugging. Testing and debugging can be difficult and time-consuming, but the ability to detect and correct programming errors is one of the most important capabilities of a good programmer. A program is considered incomplete until the programmer verifies that it performs as required.

Errors in computer programs are called bugs. Bugs may be benign and not affect the usefulness of the program, or have only subtle effects. But in some cases they may cause the program to "hang" — become unresponsive to input such as mouse clicks or keystrokes, or to completely fail or "crash". Otherwise benign bugs may sometimes be harnessed for malicious intent by an unscrupulous user writing an "exploit" — a code designed to take advantage of a bug and disrupt a program's proper execution. Bugs are usually not the fault of the computer. Since computers merely execute the instructions they are given, bugs are nearly always the result of programmer error or an oversight made in the program's design.

There are two main types of bugs in computer programs. These are coding errors and logic errors. Coding errors typically involve incorrect punctuation, incorrect word-order, undefined terms, or misuse of terms. In case of coding errors the language processor is unable to convert the source program to object program and points them out to the programmer by printing error instructions on the source listing, giving thus hints as to the nature of the error. It is a relatively easy task, therefore, to find and correct this type of errors.

The second type of errors, a logic error, is an error in planning the program's logic. In this case, the language processor successfully translates the source code into machine code, and the computer follows instructions. The problem is that the logic being followed does not produce the results that were desired.

In order to determine whether or not a logic error exists, the program must be run using sample data with known answers. By running the program and comparing the program's answers to the known answers, the accuracy of the logic plan can be determined.

Logic errors can be avoided through careful planning of the program logic, but it is the programmer's responsibility to test thoroughly all the program's functions, in order to verify that the program performs according to specifications.

Notes

Programmer's responsibility — ответственность программиста; *capabilities* — потенциальные возможности; *benign* — незначительный; *subtle* — едва различимый, трудно уловимый; *be harnessed* — использоваться; *malicious* — злонамеренный; *to disrupt* — разрушать, прерывать; *undefined terms* — неопределенные термины; *sample data* — образцы (модели) данных, *to verify* — проверять.

Lesson 5. Programming languages

I. Read and translate the text.

Usage

A programming language provides a structured mechanism for defining pieces of data, and the operations of transformations that may be carried out automatically on that data. A programmer uses the abstractions present in the language to represent the concepts involved in a computation. These concepts are represented as a collection of the simplest elements available (called primitives).

Programming languages differ from most other forms of human expression in that they require a greater degree of precision and completeness. When using a natural language to communicate with other people, human authors and speakers can be ambiguous and make small errors, and still expect their intent to be understood. However, figuratively speaking, computers do exactly what they are told to do, and cannot "understand" what code the programmer intended to write. The combination of the language definition, a program, and the program's inputs must fully specify the external behavior that occurs when the program is executed, within the domain of control of that program.

Programs for a computer might be executed without human interaction, or a user might type commands in an interactive session of an interpreter. In this case the "commands" are simply programs, whose execution is chained together. When a language is used to give commands to a software application it is called a scripting language.

Many languages have been designed from scratch, altered to meet new needs, combined with other languages, and eventually fallen into disuse. Although there have been attempts to design one "universal" computer language that serves all purposes, all of them have failed to be

generally accepted as filling this role. The need for diverse computer languages arises from the diversity of contexts in which languages are used.

Notes

A greater degree of precision and completeness — большая степень точности и завершенности; *be ambiguous*— быть неясным, сомнительным; *within the domain of control*— в домене (области) управления; *from scratch* - «на ходу».

II. Answer these questions.

1. What spectrum of languages does the user have in his/ her disposal? 2. Which languages do you call “low level”? 3. Which languages are the best for machine? 4. Which languages are the best for programmer? 5. What language do you call a machine language? 6. How is an instruction usually written in a machine language? 7. What is the difference between natural language and computer language? 8. Why is it possible for man to make mistakes? Does it prevent us from understanding each other? 9. Why have attempts to devise a universal computer language failed?

III. Render the main points of the text in English and in Russian.

IV. Read and translate the text. Express your opinion on the following points:

- the first programming languages;
- achievements of the 1930s and 1940s;
- first-generation machines;
- ALGOL, FORTRAN, LISP, BASIC, PASCAL, COBOL.

Early developments

The first programming languages predate the modern computer. The 19th century had “programmable” looms and player piano scrolls which implemented what are today recognized as examples of specific programming languages. By the beginning of the 20th century, punch cards encoded data and directed mechanical processing. In the 1930s and 1940s, the formalisms of Alonzo Church’s lambda calculus and Alan Turing’s Turing machines provided mathematical abstractions for expressing algorithms. The lambda calculus remains influential in language design.

In the 1940s, the first electrically powered digital computers were created. The first high-level programming language to be designed for a computer was Plankalkul, developed by Konrad Zuse between 1943 and 1945.

The computers of the early 1950s, notably the UNIVAC I and the IBM 701 used machine language programs. First generation machine language programming was quickly superseded by a second generation of programming languages known as Assembly languages. Later in the 1950s, assembly language programming, which had evolved to include the use of macro instructions, was followed by the development of three higher-level programming languages: FORTRAN, LISP, and COBOL. Updated versions of all these are still in general use and each has strongly influenced the development of later languages. At the end of the 1950s, the language formalized as Algol 60 was introduced, and later programming languages are, in many respects descendants of Algol. The format and use of the early programming languages was heavily influenced by the constraints of the interface.

Notes

Loom — ткацкий станок; *player piano scrolls* — автоматическое нажатие на клавиши фортепиано; *lambda calculus* — лямбда-исчисление; *in many respects* — во многих отношениях

V. *Discuss the programming languages you know.*

VI. *What do you know about “natural language” systems?*

VII. *Read the text. Comment on differences between high-level and low-level languages. Why are low-level and high-level languages inherently relative?*

High level language

The term “high-level language” does not imply that the language is always superior to low-level programming languages. It refers to the higher level of abstraction from machine language. Rather than dealing with registers, memory addresses and call stacks, high-level languages deal with usability, threads, locks, objects, variables, arrays and complex arithmetic or Boolean expressions. In addition, they have no opcodes that can directly compile the language into machine code, unlike low-level assembly language. Other features such as string handling routines, object-oriented language features and file input/output may also be present.

Stereotypically, high-level languages make complex programming simpler, while low-level languages tend to produce more efficient code. Abstraction penalty is the barrier preventing applying high level programming techniques in situations where computational resources are limited. High level programming features like more generic data structures, run-time interpretation and intermediate code files often result in slower

execution speed, higher memory consumption and larger binary size. For this reason, code which needs to run particularly quickly and efficiently may be written in a lower-level language, even if a higher-level language would make the coding easier.

However, with the growing complexity of modern microprocessor architectures, well-designed compilers for high-level languages frequently produce codes comparable in efficiency to what most low-level programmers can produce by hand, and the higher abstraction may allow more powerful techniques provide better overall results than their low-level counterparts in particular settings.

The terms “high-level” and “low-level” are inherently relative. Some decades ago, the C language (and similar languages) was most often considered “high-level”, as it supported concepts such as expression evaluation, data types and structures, while assembly language was considered “low-level”. Many programmers today might refer to C as low-level, as it lacks a large runtime-system (e.g. no garbage collection), basically supports only scalar operations, and provides direct memory addressing. It therefore readily blends with assembly language and the machine level of CPUs and microcontrollers.

Also note that assembly language may itself be regarded as a higher level (but still one-to-one) representation of machine code, as it supports concepts such as constant and limited expressions, sometimes even variables, procedures, and data structures. Machine code, in its turn, is inherently at a slightly higher level than the microcode or micro-operations used internally in many processors.

Notes

Opcode = operation code – код машинной команды, код операции; *string handling* – операции со строками символов; обработка строк; *abstraction penalty* – зд. проблемы абстракции (абстракция - широко используемый в моделировании принцип игнорирования аспектов проблемы, не оказывающих существенного влияния на её решение).

VIII. Look through the text again and comment on the differences and interrelations between high-level and low-level languages.

IX. Read the text. Select the key phrases and use them to retell it.

Viruses

Computer viruses, like physical viruses, are invidious, insidious, and often deadly. They are programs on a computer disk that generally remain undetected until their damage is done; they move from an infected disk to the system disk or another disk in the system, and they replicate

themselves, turning data into unusable nonsense when they become active. The damage is typically permanent, and anyone who has lost important files to a virus understands how serious the problem is. Other viruses are not quite deadly to your data, but do such things as slowing your computer to a crawl, putting prank messages on the screen, and the like. Some viruses wait until a particular date or other conditions before becoming active; others act immediately to inflict harm on your computer.

Viruses are often spread through shared disks; some bulletin boards were infected with Michelangelo or Stoned and unknowingly passed them on to subscribers who downloaded files — or even simply logged on to the system. Some viruses, known as Trojan horses, are designed to act like a legitimate piece of software when first used; once on your system, though, they destroy all your data.

The effect of a worm is much like that of a virus: you lose disk space and computer capability. The difference — which doesn't much matter if you've lost the use of the computer — is that a worm does not attach itself to other programs while it spreads. It does, however, write itself to each computer it encounters in a network, establishing itself on the hard disk, and using up memory until affected computer becomes disabled.

MODULE III. COMPUTER IN USE

Lesson 1. Computer systems to suit any taste

I. Read and memorize the following words and word combinations:

impetuously — стремительно
competition — конкуренция
to give rise to — порождать
to get used to — привыкать
exchange — биржа
entrepreneur — предприниматель
requirements — требования
reliable — надежный
communication — средство связи, коммуникации
transmission — передача
access — доступ
production — производство
to be short of — испытывать недостаток в чем-либо
subscriber — абонент, подписчик
to provide — запасать, снабжать, обеспечивать

II. Read and translate the text.

There are many telecommunication networks in Russia. Which one to choose?

The information and telecommunications market in Russia developed impetuously and gave rise to a sharp competition among domestic and foreign firms which offered a great number of services in computer communications and the transmission of information.

Most users have already discovered the world of telecommunications. This is proved by the number of subscribers to Relcom, the leading telecommunication network in Russia — about 150000.

Firms and individuals for whom a computer has long become a part of their life make the bulk of the “army” of users. Now they have been joined by many banks, exchanges, commercial organizations, news agencies.

Nevertheless, such an approach to practical life proved unexpected and new for many managers, entrepreneurs, organizers of production, who have got used to sending letters in envelopes in the old manner; to choose business and juridical information from heaps of publications; to keep a bulky teletype operating staff for sending telex messages and faxes with the help of a secretary.

What the global computer systems are like and what useful operations can be done with their help? It depends on your information requirements and financial possibilities. If you are ready to spend thousands of dollars, the problem of a reliable and fast communication will be solved for you, with branches and partners at home and abroad, and an access to the remote data banks. The allotted lines will provide an opportunity for a permanent round-the-clock exchange of information in the on-line regime (i.e. in the regime of an “instant” reply). You’ll be supplied with a complete communication system, the local (office) networks in various cities will be linked and a private sub-network will be arranged for your firm, agreements will be concluded with firms-owners of data bases.

But if you are short of major financial resources or for the time being cannot make up your mind on investing them in such global projects for you, too, there are possibilities (certainly, more modest) to get linked with the outside world of computers.

Spending money only on the analog and having paid a few dozen dollars for connection, one may become a subscriber to the electronic mail and commercial conferences in off-line regime (there is no permanent

connection, and the data are transmitted less promptly than in on-line regime). Having obtained the address in the electronic mail, you get an opportunity to enter from your computer into correspondence with other users of this electronic mail throughout the world. It will take a few hours for your electronic mail to be delivered to you in off-line regime. The cost of transmitting data depends on the distance and constitutes a few cents for a kilobyte (a page of a text occupies approximately 2 kilobytes).

Notes

The bulk of the "army" of users – основная масса "армии" пользователей; *a bulky teletype operating staff* – огромный штат по обслуживанию телетайпа; *for the time being cannot make up your mind on* – в настоящее время не можете решиться

III. Give the Russian equivalents.

Telecommunication networks; domestic and foreign firms; information market; entrepreneurs; organizers of production; heaps of information; a reliable and fast communication; an access to the remote data banks; a permanent round-the-clock exchange of information; local network; owners of the data bases; to get linked with; to get an opportunity; throughout the world; the cost of transmitting data; approximately.

IV. Give the English equivalents.

Получить возможность; требования к информации; финансовые ресурсы; проблема надежной связи; доступ к базе данных; острая конкуренция; стремительно развиваться; множество услуг; передача данных; стоимость зависит от расстояния; ведущая телекоммуникационная сеть; всемирная компьютерная система; соглашение; агентства новостей; предприниматель.

V. Change the following sentences into the passive.

1. Domestic and foreign firms offered a great number of services in communication and the transmission of information. 2. Most users have already discovered the world of telecommunications. 3. Computer systems can do a lot of useful operations. 4. Firms and individuals make the bulk of the "army" of users. 5. The global computer systems have to solve the problem of a reliable and fast communication. 6. The allotted lines will provide an opportunity for a permanent round-the-clock exchange of information. 7. Many managers had sent letters in envelopes in old manners

before new ways of sending messages were developed. 8. We are transmitting data in on-line regime at the moment.

VI. Insert the missing words or word combination.

1. It will ___ a few hours for your e-mail to be delivered to you in ___ regime. 2. A lot of useful operation ___ with the help of the global computer ___. 3. The information and telecommunications market in Russia gave rise to ___ among domestic and ___ firms. 4. In off-line regime the data are transmitted less ___ than in on-line ___. 5. Many managers, entrepreneurs, organizers of production have got ___ to choose business and ___ information from heaps of ___. 6. Many firms in Russia have offered a great number of ___ in computer communication and the ___ of information. 7. The cost of ___ data depends on the distance. 8. The information and ___ market in Russia ___ impetuously. 9. The cost of transmitting data ___ a few cents for a kilobyte.

VII. Answer the following questions.

1. What services did domestic and foreign firms offer? 2. Why did a sharp competition appear among these firms? 3. What telecommunication network is the leading one in Russia? 4. How did people send letters and choose business and juridical information in the past? 5. What can help you to solve the problem of a reliable and fast communication? 6. What will the allotted lines provide? 7. What is the difference between on-line and off-line regimes? 8. How can you use your address in the electronic mail? 9. What opportunity gives you the address in the electronic mail? 10. How much time does it take for your electronic mail to be delivered in off-line regimes?

VIII. Give a brief summary of the above text.

IX. Read the text and translate it without a dictionary. Write a short summary of it.

Application of personal computers

Personal computers have a lot of applications, however, there are some major categories of applications: home and hobby, word processing, professional, educational, small business and engineering and scientific.

Home and hobby. Personal computers enjoy great popularity among experimenters and hobbyists. They are an exciting hobby. All hobbyists need not be engineers or programmers. There are many games that use the

full capabilities of a computer to provide many hours of exciting leisure-time adventure.

The list of other home and hobby applications of PCs is almost endless, including: checking account management, budgeting, personal finance, planning, investment analyses, telephone answering and dialing, home security, home environment and climate control, appliance control, calendar management, maintenance of address and mailing lists and what not.

Word processing. At home or at work, applications software, called a word processing program enables you to correct or modify any document in any manner you wish before printing it. Using the monitor as a display screen, you are able to view what you have typed to correct mistakes in spelling or grammar, add or delete sentences, move paragraphs around, and replace words. The letter or document can be stored for future use.

Professional. The category of professional includes persons making extensive use of word processing, whose occupations are particularly suited to the desk-top use of PCs. Examples of other occupations are accountants, financial advisors, stock brokers, tax consultants, lawyers, architects, engineers, educators and all levels of managers. Applications programs that are popular with persons in these occupations include accounting, income tax preparation, statistical analysis, graphics, stock market forecasting and computer modeling. The computer modeling program is widely used by professionals. It can be used for scheduling, planning, and the examination of “what if” situations.

Educational. Personal computers are having and will continue to have a profound influence upon the classroom, affecting both the learner and the teacher. Microcomputers are making their way into classrooms to an ever-increasing extent giving impetus to the design of programmed learning materials that can meet the demands of student and teacher.

Two important types of uses for personal computers in education are computer-managed instruction (CMI), and computer-assisted instruction (CAI). CMI software is used to assist the instructor in the management of all classroom-related activities, such as record keeping, work assignments, testing, and grading. Applications of CAI include mathematics, reading, typing, computer literacy, programming languages, and simulations of real-world situations.

Notes

exciting leisure-time adventure — увлекательное приключение в свободное время; *stock market forecasting* — прогнозирование рынка

акций; *an ever-increasing extent* — в возрастающей степени; *impetus* — толчок, импульс; *work assignments* — задания; *grading* — сортировка, распределение

Lesson 2. The world-wide web

I. Read and memorize the following words and word combinations:

database – база данных

to store – хранить

to aware – осознавать

implementation – внедрение

to rely on – полагаться на

remote – действующий на расстоянии

ignorant – неосведомленный, не знающий

particular reference – определенная ссылка

II. Read and translate the text.

People have dreamt of a universal information database since the late 1940s. In this database, not only would the data be accessible to people around the world, but it would also easily link to other pieces of information, so that only the most important data would be quickly found by a user. Only recently the new technologies have made such systems possible. The most popular system currently in use is the World-Wide Web (WWW) which began in March 1989. The Web is an Internet-based computer network that allows users on one computer to access information stored on another through the world-wide network.

As the popularity of the Internet increases, people become more aware of its colossal potential. The World-Wide Web is a product of the continuous search for innovative ways of sharing information resources. The WWW project is based on the principle of universal readership: “if information is available, then any person should be able to access it from anywhere in the world.” The Web’s implementation follows a standard client-server model. In this model, a user relies on a program (the client) to connect to a remote machine (the server), where the data is stored. The architecture of the WWW is the one of clients, such as Netscape, Mosaic, or Lynx, “which know how to present data but not what its origin is, and servers, which know how to extract data”, but are ignorant of how it will be presented to the user.

One of the main features of the WWW documents is their hypertext structure. On a graphic terminal, for instance, a particular reference can be

represented by underlined text, or an icon. “The user clicks on it with the mouse, and the referenced document appears.” This method makes copying of information unnecessary: data needs only to be stored once, and all referenced to it can be linked to the original document.

Notes

Netscape Navigator— шестой по популярности в мире браузер, производившийся компанией *Netscape Communications* с 1994 по 2007 год, последние версии на основе движка браузера *Mozilla Firefox*. Версии *Netscape* до четвертой были основными конкурентами *Internet Explorer*, версии 6—7.2 были основаны на *Mozilla Application Suite*.

Mosaic — это первый веб-браузер под операционную систему *Microsoft Windows* (тогда ещё MS-DOS с графической оболочкой MS Windows 3) с графическим интерфейсом пользователя и развитыми возможностями, на котором основаны и *Netscape Navigator*, и *Microsoft Internet Explorer*.

Lynx — один из первых текстовых браузеров.

III. Give the Russian equivalents.

Database, around the world, to be stored, continuous search, to be accessible, implementation, to rely on something, to be ignorant, features, particular reference, underlined text, referenced documents, unnecessary.

IV. Find in the text the English equivalents of the following Russian words and phrases.

Внедрение, распределение, хранение информации, база данных, ссылка, инновационный путь, доступный, поиск, связывать, обмениваться информацией.

V. Read the following international words, guess their meanings and derive nouns and adjectives from them.

Noun	Adjective
technology	—
system	—
—	popular
information	—
—	colossal
potential	—
—	universal
machine	—

architecture	—
structure	—
—	original
document	—

VI. Answer the following questions.

1. What have people dreamt of? 2. What systems employ new technologies made accessible to people around the world? 3. What possibilities does the Internet give its users? 4. What does the popularity of the Internet lead to? 5. What is the principle of the universal readership? 6. What are the main features of the WWW documents?

VII. Speak on the advantages of the Internet.

VIII. Read the text without a dictionary. Speak briefly on the WWW success.

Success of the WWW

Set of in 1989, the WWW quickly gained great popularity among Internet users. What is the reason for the immense success of the World-Wide Web? Perhaps, it can be explained by CERN's attitude towards the development of the project. As soon as the basic outline of the WWW was complete, CERN made the source code for its software publicly available. CERN has been encouraging collaboration by academic and commercial parties since the onset of the project, and by doing so it got millions of people involved in the growth of the Web.

The system requirements for running a WWW server are minimal, so even administrators with limited funds had a chance to become information providers. Because of the intuitive nature of hypertext, many inexperienced computer users were able to connect to the network. Furthermore, the simplicity of the Hyper Text Markup Language, used for creating interactive documents, allowed these users to contribute to the expanding database of documents on the Web. Also, the nature of the World-Wide Web provided a way to interconnect computers running different operating systems, and display information created in a variety of existing media formats.

In short, the possibilities for hypertext in the world-wide environment are endless. With the computer industry growing at today's pace, no one knows what awaits us in the 21st century.

Notes

CERN — Европейская организация по ядерным исследованиям, крупнейшая в мире лаборатория **физики высоких энергий**. Также иногда переводится как Европейский Центр ядерных исследований. Аббревиатура CERN произошла от **фр.** Conseil Européen pour la Recherche Nucléaire (Европейский совет по ядерным исследованиям). В русском языке обычно используется аббревиатура ЦЕРН.

IX. Read the text. Retell it in Russian or in English.

Brief history of the Internet

In 1973 the Defense Advanced Research Projects Agency (DARPA) initiated a research program to investigate techniques and technologies for interlinking packet networks of various kinds. The objective was to develop communication protocols which would allow networked computers to communicate transparently across multiple, linked packet networks. This was called the Internetting project and the system of networks which emerged from the research was known as the “Internet” (Intercontinental Network).

During the course of its evolution, particularly after 1989, the Internet system began to integrate support for other protocol suites into its basic networking fabric. By the end of 1991 the Internet has grown to include some 5 000 networks in over three dozen countries, serving over 700,000 host computers used by over 4,000,000 people.

The bulk of the system today is made up of private networking facilities in education and research institutions, business and in government organizations across the globe.

A secretariat has been created to manage the day-to-day function of the Internet Activities Board (IAB) and Internet Engineering Task Force (IETF). IETF meets three times a year in plenary and in approximately 50 working groups convene at intermediate times by electronic mail, teleconferencing and at face-to-face meetings.

There are a number of Network Information Centres (NICs) located throughout the Internet to serve its users with documentation, guidance, advice and assistance. As the Internet continues to grow internationally, the need for high quality NIC functions increases. Although the initial community of users of the Internet were drawn from the ranks of computer science and engineering its users now comprise a wide range of disciplines in the sciences, arts, letters, business, military and government administration.

Notes

Techniques — методы; *bulk* — объем; *Internet Engineering Task Force* (Специальная комиссия Интернет разработок) — открытое международное сообщество проектировщиков, учёных, сетевых операторов и провайдеров, созданное **IAB** (Internet Architecture Board) в **1986 году**, которое занимается развитием протоколов и архитектуры **Интернета**. *approximately* — приблизительно; *convene* — собираться

Lesson 3. Internet frequently asked questions (FAQs)

I. Look through the questions given below and try to answer them.

How old is the Internet (the Net)?
Who created the Internet?
Did the Internet become popular quickly?
How do you get online?
How fast are today's internet connections?
How long has broadband existed?
How much does broadband cost?
Why do you need a modem?
What does TCP/IP mean?
Are there other ways of accessing the Internet?

II. Study the answers to the questions given above. Give some additional information.

1. It's hard to say exactly. The research that led to what we now know as the Internet was begun in the 1960s.

2. It's hard to say exactly who did it. The initial research was carried out by the Advanced Research PROJECTS Agency in America, funded by the US government.

3. It took many years for the Internet to become popular. It's since the mid-90s that the Internet has been a part of our daily lives.

4. To get connected, you need the right connection software and a modem. You also need an account with the Internet Service Provider (ISP), which acts as a gateway.

5. The most common types of ISPs are cable — offered by local cable TV companies — and ADSL (Asymmetric Digital Subscriber Line). Broadband access is also offered by some electricity networks. This technology is known as power-line Internet, but it is still in development.

6. Since the late 1990s.

7. It depends on which company you choose.

8. A modem (modulator/ demodulator) converts digital signals into analogue ones so that data can be transmitted across the phone or cable network.

9. That's the language used for data transfer. This is like the internet operating system. Computers connected to the Net are identified by a unique IP address.

10. Other methods include Wi-Fi, satellite, mobile phones and TV sets. Wi-Fi-enabled laptops or PDAs allow you to connect to the Net if you are near a wireless access point, in locations called hotpots (e.g. a Wi-Fi café, park or campus). Satellite services are used in places where terrestrial access is not available (e.g. on ships at sea).

III. Which of the internet systems (1-6) you would use to do the tasks (A-F).

1	Email	A	transfer files from the Net to your hard drive
2	The Web	B	send a message to another person via the Net
3	Newsgroups	C	have a live talk (usually typed) online
4	Chat and IM	D	connect to a remote computer by entering instructions, and run a program on it
5	FTP	E	take part in public discussion areas devoted to specific topics
6	Telnet	F	download and view documents published on the Internet

IV. Now read Part 2 of the FAQs and check your answers.

Internet FAQs: Part 2

Email lets exchange messages. Optional attached files can include text, pictures, audio and animation. A mailing list uses email to communicate to everyone that belongs to the list.

Which email program is the best? Outlook Express is a popular program, but many users use web-based 3email accounts such as Hotmail.

The Web consists of billions of documents living on web servers that use the HTTP protocol. You navigate through the Web using a web browser, which lets you search, view and print web pages.

How often are web pages updated? Some web pages are updated thousands of times a day.

Chat and Instant Messaging technologies allow having real-time conversations online, by typing messages at the keyboard.

FTP, or file transfer protocol, is used to transfer files over a TCP/IP network. This feature is nowadays built into browsers to let you download files to your hard drive.

Telnet is a protocol and a program used to log onto remote computer systems. You can enter commands which will be executed as if you were entering them directly on the remote server.

Newsgroups are the public discussion areas which make up a system called Usenet. The contents are contributed by people who post articles or respond to articles, creation chains of relating postings called message threads. You need a newsreader which may be a stand-alone program or part of a web browser. There are about 30,000 active newsgroups.

Your newsreader allows you to download the newsgroup addresses that your ISP has included on its news server. An alternative is to visit web forums instead, which perform the same function but without the additional software.

V. Find words and phrases in Part 2 with the following meanings.

- 1 a system used to distribute email to many different subscribers at once
- 2 a program used for displaying web pages
- 3 to connect to a computer by typing your username and password
- 4 a series of interrelated messages on a given topic
- 5 a program for reading Usenet newsgroups

VI. Read and translate the text.

Electronic mail

Electronic mail or e-mail is the electronic transmission of messages, letters, and documents. In its broadest sense electronic mail includes point-to-point services such as telegraph and facsimile (fax) systems. It is commonly thought of, however, in terms of computer-based message systems where the electronic text file that is received can be edited, replied to, excerpted, or even pasted into another electronic document that can be used or manipulated by a word processor, desktop publishing system, or other computer program. Users of such systems, called store-and-forward or mailbox systems, can broadcast messages to multiple recipients, read and discard messages, file and retrieve messages, or forward messages to

other users. Extensions to e-mail allow the user to add graphics and sound to messages, and files can be attached to e-mails. Computer-based messaging can take place on a single computer, a computer network, or across gateways linking different computer networks (as through the Internet). With the increasing use of e-mail, unsolicited commercial e-mail, known as spam, has become a significant problem. E-mail, especially through attachments, has also become a means for disseminating computer viruses and other malicious programs.

Lesson 4. The collectives of cyberspace

I. Read the text and find websites for the following tasks.

- To search for information on the web
- To buy books and DVDs
- To participate in political campaigns
- To view and exchange video clips
- To manage and share personal photos using tags
- To buy and sell personal items in online auctions
- To download music and movies, sometimes illegally

The Internet isn't just about email or the Web anymore. Increasingly, people online are taking the power of the Internet back into their own hands. They're posting opinions on online journals — weblogs, or blogs; they're organizing political rallies on MoveOn.org; they're trading songs on illegal file-sharing networks; they're volunteering articles for the online encyclopedia *Wikipedia*; and they're collaborating with other programmers around the world. Thanks to new technologies such as blog software, peer-to-peer networks, open-source software, and wikis, people are getting together to take collective actions like never before.

eBay, for instance, wouldn't exist without the 61 million active members who list, sell, and buy millions of items a week. But less obvious is that the whole marketplace runs on the trust created by eBay's unique feedback system, by which buyers and sellers rate each other on how well they carried out their half of each transaction.

Pioneer *e-tailer* Amazon encourages all kinds of customer participation in the site — including books, CDs, DVDs and electronic goods. *MySpace* and *Facebook* are phenomena in social networking, attracting millions of unique visitors. Many are music fans, who can blog,

email friends, upload photos, etc. There's even a 3-D virtual world entirely built and owned by its residents, called Second Life, where real companies have opened shops, and pop stars such as U2 have performed concerts.

Some sites are much more specialized, such as the photo-sharing site *Flickr*. There, people not only share photos but also take the time to attach tags to their pictures, which help everyone else find photos of, for example, Florence, Italy. Another successful site based on user-generated content is YouTube, which allows users to upload, view and share movie clips and music videos, as well as amateur videoblogs. Another example is the Google search engine. Its mathematical formulas surf the combined judgments of millions of people whose websites link to other sites.

Skype looks like software that lets you make free phone calls over the Internet — which it does. But the way it works is extremely clever. By using Skype, you're automatically contributing some of your PC's computing power and Internet connection to route other people's calls.

It's an extension of the peer-to-peer network software such as BitTorrent that allow you to swap songs — at your own risk if those songs are under copyright. BitTorrent is a protocol for transferring music, films, games and podcasts.

A podcast is an audio recording posted online. Podcasting derives from the words iPod and broadcasting. You can find podcasts about almost any topic —sports, music, politics, etc. They are distributed through RSS (Really Simple Syndication) feeds which allow you to receive up-to-date information without having to check the site for updates. BitTorrent breaks the files into small pieces, known as chunks, and distributes them among a large number of users; when you download a torrent, you are also uploading it to another user.

Adapted from Business Week online

Lesson 5. Home computer

I. Read and translate the text.

II. State the problems it describes.

III. In a paragraph of 70-90 words summarize the problems involved.

The single most important item in our century's households is the computer. These electronic brains govern everything from meal preparation and waking up the household to assembling shopping lists and keeping track of the bank balance. Sensors in kitchen appliances, climatizing units,

communicators, power supply and other household utilities warn the computer when the item is likely to fail.

Computers also handle travel reservations, relay telephone messages, keep track of birthday and anniversaries, compute taxes and even figure the monthly bills for electricity, water, telephone and other utilities. Not every family has its private computer. Many families reserve time on a city or regional computer to serve their needs. The machine tallies up its own services and submits a bill, just as it does with other utilities.

A home computer was a class of personal computer entering the market in 1977 and becoming common during the 1980s. They were marketed to consumers as accessible personal computers, more capable than video game consoles. These computers typically cost much less than business, scientific or engineering-oriented desktop personal computers of the time, and were generally less powerful in terms of memory and expandability. However, a home computer often had better graphics and sound than contemporary business personal computers. Usually they were purchased for education, game play, and personal use.

Advertisements for early home computers were rife with possibilities for their use in the home, from cataloguing recipes to personal finance to home automation, but these were seldom realized in practice as they usually required the home computer user to learn computer programming.

Computers are used in the home even more today, and the line between a “business” computer and a “home” computer has blurred, since they typically use the same operating systems, processor architectures, applications and peripherals.

Background

The home computer became affordable for the general public due to the mass production of the microprocessor. Early microcomputers had front-mounted switches and blinkenlights to control and indicate internal system status, and were often sold in kit form. These kits would contain an empty printed circuit board which the purchaser would fill with the integrated circuits, other individual electronic components, wires and connectors, and then hand-solder all the connections. In contrast, home computers were designed to be used by the average consumer, not necessarily an electronics hobbyist.

Early home computers such as Sinclair ZX80, and Acorn Atom could be purchased in kit form (or assembled), other home computers were sold only pre-assembled. They were enclosed in molded plastic cases, which were attractive to consumers and lower cost than the metal card-cage enclosures used for the Altair and similar computers. A keyboard was

usually built into the case. Ports for plug-in peripheral devices such as a video display, cassette tape recorders, joysticks, and (later) disk drivers either were provided or available as add-on cards.

Usually the manufacturer would provide the entire peripheral devices as extra cost accessories. Often peripherals were not interchangeable between brands of home computer (or sometimes even between successive models of the same brand).

To save the cost of a dedicated monitor, the home computer often would have connected either directly or through an RF modulator to the family TV set as video display and sound system.

Almost universally, home computers had a version of the BASIC programming language in read-only permanent memory. One exception was the Jupiter Ace, which had the Forth language built in. After the success of systems like the RadioShack TRS-80, the Commodore PET and the Apple2 in 1977, large numbers of new machines of all types began to appear during the late 1970s and early 1980s.

Home computers competed with video game consoles. The markets weren't entirely distinct, as both could be used for games. A common marketing tactic was to show a computer system and console playing games side by side, then emphasizing the computer's greater ability by showing it running user-created programs, educational software, word processing, spreadsheet and other applications while the game console showed a blank screen or continued playing the same repetitive game. During the peak years of the home computer market, scores of models were produced, usually with little or no thought given to compatibility between different manufacturers or even within product lines of one manufacturer. The concept of a computer platform did not exist, except for the Japanese MSX standard.

The introduction of the IBM Personal Computer in August 1981 would eventually lead to standardization in personal computers, largely due to the system's open architecture, which encouraged production of third-party clones of the unit. While the Apple2 would be quickly displaced by the IBM PC for office use, Apple Computer's 1984 release of the Apple Macintosh created a new model for the home computer which IBM-compatible computers would eventually imitate.

Technology

The basic layout of a typical home computer system of the era comprises the CPU/ keyboard unit, floppy disk drive, and dedicated color monitor. Many systems also had a dot matrix printer for producing paper output.

Many home computers were superficially similar. Most had a keyboard integrated into the case; sometimes a cheap-to-manufacture chiclet keyboard in the early days, although full-travel keyboards quickly became universal due to overwhelming consumer preference. Most systems could use an RF modulator to display 20-40 column text output on a home television. The use of a television set as a display almost defines the pre-PC home computer. Although computer monitors were available for this market segment, it was often a later purchase made after users had bought a floppy disk drive, printer, modem, and the other pieces of a full system. This “peripherals sold separately” is another defining characteristic of home computers. Many first time computer buyers brought a base C-64 system home to find they needed to purchase a disk drive or Datassette to be able to make use of it.

In the early 1980s, home computers were mostly based on 8-bit microprocessor technology, typically the MOS Technology 6502 or the Zilog Z80. A notable exception was the TT-99 series, announced in 1979 with a 16-bit TMS9900 CPU.

Processor clock rates were typically 1-2 MHz for 6502 based CPUs and 2-4 MHz for Z80 based systems, but this aspect of performance was not emphasized by users or manufacturers, because the systems’ limited RAM capacity, graphics capabilities and storage options were of primary importance. Clock speed was considered a technical detail of interest only to users needing accurate timing. To economize on component cost, the same crystal used to produce colour television compatible signals was also used for the processor clock. This meant processors rarely operated at their full rated speed, and had the side-effect that European and North American version of the same home computer operated at slightly different speeds and different video resolution due to different television standards.

Many home computers initially used the then-ubiquitous compact audio cassettes as a storage mechanism but they were notoriously slow and unreliable. Most software for home computers remained sold on 5.25" disks, however, 3.5" drives were used for data storage. Standardization of disk formats was not common; sometimes even different models from the same manufacturer used different disk formats. Various copy protection schemes were developed for floppy disks but most were broken in short order, so having a backup disk of vital application software was seen as important.

In contrast to modern computers, home computers most often had their OS stored in ROM chips. This made startup times very fast — no more than a few seconds — but made upgrades difficult or impossible

without buying a new unit. Usually only the most severe bugs were fixed by issuing new ROMs to replace the old ones. The user interface was usually only a BASIC interpreter coupled to a character-based screen or line editor, with applications performing all other OS duties themselves. As multitasking was not common on home computers until the 1980s, this lack of API support wasn't of much importance. Application programs usually accessed hardware directly to perform a specific task, often "switching out" the ROM based OS to free the address space it occupied and maximize RAM capacity. Most home computers loaded their Disk Operating System (DOS) separately from the main OS. The DOS was only used to send commands to the floppy disk drive and needn't be loaded to perform other computing functions. Many home computers also had a cartridge interface which accepted ROM-based software. This was occasionally used for expansion or upgrades such as fast loaders, and application software on cartridge did exist, but the vast majority of cartridges were games.

MODULE IV. PROBLEMS AND PROSPECTS

Lesson 1. Will technical progress stop?

I. Read and memorize the following words and word combinations:

to surround – окружать

handy – зод. доступный, под рукой

wage – заработная плата

to substitute – заменять

network of wireless-connected computers – беспроводная компьютерная сеть

to merge – сливаться

up-to-date – современный, новейший

benefit – преимущество, выгода

foreseeable – прогнозируемый, предсказуемый

vaccination record – записи прививания

II. Read and translate the text.

As the years go forward our life becomes faster, a lot of new things appear, our mind develops and it cannot stop. It's like a strong river which never ends to run and it is rapidly spreading all over the earth. Many centuries ago people even couldn't imagine that we will be able to exchange information using telephone, fax, Internet as long as they

couldn't think that there are a lot of planets except our Earth and that people can fly there. If we think how everything had developed, how many new things had appeared and how the minds of people had become so wide we even won't be able to understand it because nowadays we cannot imagine our life without such inventions as lamps, ovens, central heating and others. During the centuries people have been inventing things to make our life easier. A great invention such as transport plays one of the most important roles in our life. We live in flats, can appear in any point of the Earth within a day, can say hello to people who live in another point of the world. All those things are a product of technical progress and it doesn't stop to grow and develop. Nowadays we live surrounded by machines and other inventions. With new inventions we become happier because nearly everything is being made by machines and not by ourselves. From day to day more and more new things appear. And we don't think about how the first inventions were created. The only thing we know that we never will return to the life which people lived a lot of centuries ago because there is no way back.

Everything is handy. We use at home vacuum cleaners to clean the flat, ovens to cook, lifts to walk down in our houses, lamps to make our flats light.... There are a lot of such things and we even don't think about when and where and who invented it. And it's so simple and so dear to us that we cannot live without it. Our century is a century of developing informational connections. Faxes, TV, Internet, and Telephone became the most popular ways of getting and sending information. One of the greatest inventions of the century is computer. It's the coup in the technology. When Charles Babbage (1792-1871), Professor of mathematics at Cambridge University invented the first calculating machine in 1812 he could hardly have imagined the situation we find ourselves today. Computer becomes like a brain of human but the only thing it cannot do is to feel. Other things are easy to it. As everything computers also develop. The possibilities of it are so wide. It can do more than 500,000 sums in a fraction of a second. Programming became one of the most useful and popular profession. Nowadays computers can pay wages, reserve seats on planes, control sputniks, compose music. Also everybody knows the words CD ROM, a means of storing information on a disk to be read by a computer, e-mail, which becomes one of the ways to exchange information, the Internet — a network that is a way to get information, to communicate with people, to find everything you need. More and more people become Internet users because we can do so many things there: we can chat there, find job, pay bills, get music, buy

something, find essays, learn the latest news, exchange information with other people by e-mail and so on. It became a usual thing to be connected to Internet. It attracts by a wide variety of different kinds of information which is necessary to people. The main point of many inventions — vacuum cleaners, which we use at home, radio, TV sets, mixers, refrigerators, one of the most important thing in every flat — is that they all appeared only after the invention of electricity. So the question of technical progress is very wide but one thing is quite obvious — it won't ever stop and machines will continue substituting everything except the human being.

Notes

It's the coup in the technology – Это был переворот в технике.

III. Give the Russian equivalents.

Spreading all over the earth, exchange information, nowadays, central heating, great invention, technical progress, informational connection, a fraction of a second, reserve seats on planes, a means of, a wide variety of.

IV. Give the English equivalents.

Расти и развиваться, много веков назад, самый распространенный способ получения и отправки информации, вычислительная машина, программирование, оплачивать счета, искать рефераты, обмениваться информацией, изобретение электричества.

V. Complete the sentences.

1. Nowadays we live surrounded by _____. 2. We use at home vacuum cleaners to _____, ovens to _____, lifts to _____, lamps to _____. 3. Our century is a century of _____. 4. Faxes, TV, Internet, and Telephone became _____. 5. Programming became _____. 6. Internet attracts users by _____ which is necessary to people.

VI. Answer the following questions.

1. What are the most important inventions of today? 2. How can we exchange information? 3. Why is computer the greatest invention of the century? 4. What is Charles Babbage famous for? 5. What can a modern computer do? 6. What is the Internet useful for? 7. Why does the author think that the technical progress won't stop?

VII. Find in the text the information on:

- the history of computers;
- the great inventions of humankind;
- the difference between human brain and computers;

VIII. Do you agree with the author when he says that “the technical progress won’t stop and the machines will substitute everything except one the human”? Prove it.

Lesson 2. The future of computers

I. Read and memorize the following words and words combinations:

advantage – преимущество

development work – работа по созданию

cost-effective – подходящий по цене

to design – конструировать, проектировать

incredibly – невероятно

to approach – приближаться

corresponding increase – соответствующее повышение

to accomplish – выполнять

pictorially – графически

to straighten out – расположить должным образом

actually – на самом деле, фактически

to be in a fairly widespread use – довольно широко использоваться

value – ценность

II. Read and translate the text.

During the past decade development work for extremely powerful and cost-effective computers has concentrated on new architectures. In place of “scalar” processors, the emphasis moved towards “vector” and “parallel” processors, commonly referred to as “supercomputers”. These machines are now in widespread use in many branches of science. Vectorization of quark field calculations in particle physics has improved performance by factors of ten or twenty compared with the traditional scalar algorithms.

Computers must still be programmed for every action they take which is a great limitation. How quickly the programmer can tell it what to do becomes a major drag on computer speeds. The time lag can be shortened by linking up different computers and designing more efficient

ways to jam information in and pull it out of the machine, but the basic limitation of the step-by-step program remains.

The incredibly rapid speeds we are approaching will be of little value without a corresponding increase in the speed with which we can get at the computer-generated information. A new approach, called graphics, uses the cathode-ray tube — the picture tube of your TV set — to display the information pictorially. A light pen — actually an electronic pointer — can be touched to the screen, and conversation between man and machine can be accomplished. For example, the computer can flash a series of options on its screen. The scientist selects the one he wants by touching it with a light pen. The great advantage of these so-called graphic computers is in solving design problems and in coping with any trial-and-error situation.

The graphic computer offers the most flexible means of communication between man and machine yet developed. For example, the designer can draw a car roof on the screen with his light pen. The computer will do the mathematics required to straighten out the lines and, in effect, present a draftsman's version of the designer's idea. The computer will then offer a variety of options to the designer — "front view", "cross section", and so on. All the designer needs to do is to touch his light pen to the appropriate choice, and the computer does the rest.

Notes

Vectorization of quark field calculations in particle physics has improved performance by factors of ten or twenty — векторизация вычислений кваркового поля в квантовой физике повысило качество и результативность научных исследований в 10 или 20 раз. *To jam information in and pull it out of the machine* — чтобы сжать информацию при вводе и выводе ее из машины; *in coping with any trial-and-error situation* — при воспроизведении любой ситуации методом подбора.

III. Give the Russian equivalents.

Development work; powerful computers; in place of; in fairly widespread use; the time lag; a great limitation; to design more efficient devices; step-by-step; will be of little value; computer-generated information; to display the information pictorially; a light pen; an electronic pointer; a series of options; to solve design problems; the most flexible means of communication; to straighten out the lines; the designer's idea; a draftsman's version

IV. Give the English equivalents.

В течение последнего десятилетия; довольно широко используются; время запаздывания может быть сокращено; сжать информацию; пошаговая программа; невероятно высокие скорости; катодно-лучевая трубка; более эффективные устройства; электронная указка; показывать информацию графически; большое преимущество; нестандартная ситуация; в результате; подходящий вариант; так называемый; задачи проектирования; самые совершенные средства связи.

V. Finds pairs of synonyms.

To calculate; a device; information; to display; to design; development; to choose; appropriate; to accomplish; in place of; for example; to link; to concentrate; to straighten out; an option; an idea; a choice; for instance; a project; to focus; to carry out; to show; progress; to compute; proper; an apparatus; to select; to smooth out; to connect; instead of; data; to construct.

VI. Complete the following sentences.

1. The time lag can be shortened by linking up different computers and designing more efficient to ____ and _____. 2. These machines are now in fairly widespread use in many _____. 3. Graphics uses the cathode-ray tube to display the information _____. 4. The great advantage of these so-called graphic computers is in ____ and in _____. 5. The scientist selects the option by touching it with a _____. 6. The computer can flash a series of options on its _____. 7. All the designer needs to do is to touch his light pen to the _____. 8. The graphic computer offers the most flexible means of communication between man and machine yet _____. 9. How quickly the programmer can tell his computer what to do becomes a major drag on _____. 10. Computers must still be programmed for every action they take which is a _____.

VII. Answer these questions.

1. What changes have taken place in development work for extremely powerful computers during the past decade? 2. What kind of processor is usually called a supercomputer? 3. What is a great limitation of a computer? 4. How can the time lag be shortened? 5. What approach can be used to display the information pictorially? 6. What is a light pen? 7. What is the great advantage of graphic computers? 8. What means of communication between man and machine does the graphic computer

offer? 9. What options can the computer offer to present a draftsman's version of the designer's idea?

VIII. Read the texts without the dictionary. Retell them either in Russian or in English.

Optical switches

Until now, the switches inside computers have been electronics. European scientists are going to demonstrate the world's first optical computer. This demonstration will come 22 years after the theory behind optical computers was first predicted by researchers from the computer company IBM.

However, there is still a large gap between what theoretical physicists believe can be done, and what electronic engineers know is possible.

In theory, optical switches leave their electronic counterparts standing. It is like comparing the speed of light with the speed of electricity. Optical switches are so fast and yet so small that an optical device of one square centimeter can resolve 10^4 separate spots of light and each can be switched on and off at a speed of 30 nanoseconds. This means that an optical device one square centimeter in area could, in theory at least, handle 3×10 bits per second.

Notes

Leave their electronic counterparts standing – во много раз превосходят свои электронные аналоги.

Who knew modern technology — cable technology — turns thoughts into action!

Brown University has developed a computer system that allows a paralyzed person to use thoughts to become actions. A cable is plugged into electrodes in man's head. This allows him to image movements which then occur. He has moved a computer cursor, opened e-mail and turned on a television. This is done with imagination and a computer program.

The results have been reported in an issue of the journal Nature. Imagine the significance of this. Many people are paralyzed and unable to function on a daily basis. This new technology holds out hope for many. At this point, the patient is in a card loaded with electronics. A cable plugs into the skull for the final connection to the patient. Brown University is hoping to create a wireless implant device. The current implant senses brainwave patterns when the patient thinks simple commands.

The scientific community has been waiting years for this brain-wave technology. They and we look forward to future developments. Improvements will surely come and provide some relief to the patients who quietly wait.

Lesson 3. Internet security

I. Discuss these questions.

1. What is a hacker?
2. How easy do you think it is to infiltrate the Internet and steal sensitive information?
3. How can you protect your computer from viruses and spyware?

II. Read the text quickly and see how many of your ideas from Ex. 1 Question 3 are mentioned in it?

III. Read the text carefully and answer these questions.

1. Why is security so important on the Internet?
2. What security features are offered by Mozilla Firefox?
3. What security protocol is used by banks to make online transactions secure?
4. How can we protect our email and keep it private?
5. What methods are used by companies to make internal networks secure?
6. In what ways can a virus enter a computer system?
7. How does a worm spread itself?

There are many benefits from an open system like the internet, but one of the risks is that we are often exposed to hackers, who break into computer system just for fun, to steal information, or to spread viruses. Originally, all computer enthusiasts and skilled programmers were known as hackers, but during the 1990s, the term hacker became synonymous with cracker — a person who uses technology for criminal aims. Nowadays, people often use the word hacker to mean both things. In the computer industry, hackers are known as white hats and crackers are called black hats or darkside hackers.

So how do we go about making our online transactions secure?

Security on the Web. Security is crucial when you send confidential information online. Consider, for example, the process of buying a book on the Web. You have to type your credit card number into an order form which passes from computer to computer on its way to the online bookstore. If one of the intermediary computers is infiltrated by hackers, your data can be copied.

To avoid risks, you should set all security alerts to high on your web browser. Mozilla Firefox displays a lock when the website is secure and allows you to disable or delete cookies — small files placed on your hard drive by web servers so that they can recognize your PC when you return to their site.

If you use online banking services, make sure they use digital certificates — files that are like digital identification cards and that identify users and web servers. Also be sure to use a browser that is compliant with SSL (Secure Sockets Layer), a protocol which provides secure transactions.

Email privacy. Similarly, as your email travels across the Net, it is copied temporarily onto many computers in between. This means that it can be read by people who illegally enter computer systems.

The only way to protect a message is to put it in a sort of virtual envelope — that is, to encode it with some form of encryption. A system designed to send email privately is Pretty Good Privacy, a freeware program written by Phil Zimmerman.

Network security. Private networks can be attacked by intruders who attempt to obtain information such as Social security numbers, bank accounts or research and business reports. To protect crucial data, companies hire security consultants who analyse the risks and provide solutions. The most common methods of protection are passwords for access control, firewalls, and encryption and decryption systems. Encryption changes data into a secret code so that only someone with a key can read it. Decryption converts encrypted data back into its original form.

Malware protection. Malware (malicious software) are programs designed to infiltrate or damage your computer, for example, viruses, worms, Trojans and spyware. A virus can enter a PC via a disc drive — if you insert an infected disc — or via the Internet. A worm is a self-copying program that spreads through email attachments; it replicates itself and sends a copy to everyone in an address book. A Trojan horse is disguised as a useful program; it may affect data security. Spyware collects information from your PC without your consent. Most spyware and adware (software that allows pop-ups — that is, advertisements that suddenly appear on your screen) is included with “free” downloads.

If you want to protect your PC, don’t open email attachments from strangers and take care when downloading files from the Web. Remember to update your anti-virus software as often as possible, since new viruses are being created all the time.

IV. Fill in the blanks.

1. Users have to enter a ____ to gain access to a network. 2. A ____ protects a company intranet from outside attacks. 3. A ____ is a person who uses their computer skills to enter computers and networks illegally. 4. ____ can infect your files and corrupt your hard drive. 5. You can download ____ from the Net; this type of software is available free of charge but protected by copyright. 6. Encoding data so that unauthorized users can't read it is known as _____. 7. This company uses ____ techniques to decode (or decipher) secret data. 8. Most ____ is designed to obtain personal information without the user's permission.

Lesson 4. Computer crimes

I. Read and translate the text.

The headlines tell us about computer crimes after they have been discovered. Hackers are arrested for using telephone and credit card numbers other than their own to acquire goods and money; someone with a distinctly different sense of humor infects software with a virus that causes fish to swim across the spreadsheet. Another someone changes all the scholarship information in the financial office, and yet another uses the company computer — on company time — to do a little freelance writing or software development for an outside client. These are not jokes. These are crimes.

Like most other technological advances, the computer is a tool, one that can be used for good or ill. You can save time with computers, writing better spelled and better typed papers. You can balance budgets, from the personal to professional; input and store and process and output all kinds of information; and send it around the world as fast as telephone lines and satellites can carry it. You can use computers to spy. To lie and cheat. To steal. To do harm.

Although peeking at someone's private records may not seem a heinous crime, electronic trespass is a crime. Peekers who gain access to a co-worker's personal file or to a neighbour's checking account records are trespassing, just as they would be if they were physically in the bank. They have entered another's computer system or file without permission — hence, illegally.

The problem of trespassing is compounded when data is altered or destroyed. Although there may sometimes be no intent to alter data and the changes are only the result of striking the wrong key, this is a very rare occurrence. In most cases, the trespasser has something to gain from the

alterations. The gain may be real, as in stealing company secrets for example. The gain may be strictly personal and vengeful: changing hospital records or credit ratings, destroying social security records, or inserting false and defamatory information in a personal file. These crimes are serious, and they are costly.

Electronic funds transfers take money from one account and move it to another. Banks do this when authorized by legitimate customers. But bank employees have also been known to do it without authorization, directing the funds into their own accounts. The transfer of a million dollars will be quickly noted, but transfer of one-tenth of a cent from every customer's monthly interest will not — and those fractional cents can quickly add up to many dollars.

Business and industry also have much to lose through electronic trespass. Information about new products, stock transfers, plans to acquire another company and other proprietary information can be worth millions of dollars to the company or its competitors.

The danger of computer's misuse increases. We have an obligation to use computers responsibly — in ways that are not harmful to the society in which we live and work.

II. Look at the list of cybercrimes and discuss these questions.

1. Which crimes are the most dangerous? 2. Is it fair or unfair to pay for the songs, videos, books or articles that you download? Should copyright infringement be allowed online? 3. What measures can be taken by governments to stop cybercrime? 4. Do you think governments have the right to censor material on the Internet? 5. Personal information such as our address, salary, and civil and criminal records is held in databases by marketing companies. Is our privacy in danger?

Cybercrimes

- Piracy** — the illegal copy and distribution of copyrighted software, games or music files

- Plagiarism and theft of intellectual property** — pretending that someone else's work is your own

- Spreading of malicious software**

- Phishing (password harvesting fishing)** — getting passwords for online bank accounts or credit card numbers by using emails that look like they are from real organizations, but are in fact fake; people believe the message is from their bank and send their security details

- IPspoofing** — making one computer look like another in order to gain unauthorized access

•**Cyberstalking** — online harassment or abuse, mainly in chat rooms or newsgroups

•**Distribution of indecent or offensive material**

III. Write a summary of your discussion on PowerPoint and present it to the rest of the class.

Lesson 5. Computer games in education

I. Read the title of the text, which gives you an idea of what it is about. Before you read the text, think of some ways in which computer games might have educational benefits for children. Make a list of at least three of them.

II. Read the text to see if you agree with the experts.

Computer games have come a long way since *Pong*, a high tech version of table tennis, became the first to hit the screen in 1972. The vast majority of children now regularly play games on the computer. One research has suggested that a fifteen-year-old teenager devotes 30 hours a week to them, though the majority are moderate consumers.

What does it do to young minds?

For years concern has been expressed by parents and teachers about the effect of computer games on the moral and mental make-up of the next generation. Some have warned that a relentless diet of whiz-bang “shoot-‘em-ups” fosters antisocial behaviour, even playground violence. Others believe that the age of the zombie is upon us.

But expert opinion is shifting radically. Psychologists in America and Britain now suggest that while computer games hold some dangers for children, they also provide opportunities their parents never enjoyed to amplify powers of concentration and memory. Researchers have also highlighted the positive response of children to the way computer games reward success, thereby spurring them on to look for greater challenges if the same attitude is applied to school work. A leading academic at the University of Washington has never claimed that children think differently when they play computer games, learning to deal with problems in parallel rather than in sequence. In effect, children are being trained to tackle problems in a fashion which is not only more rapid but also more effective. In the long term, the facility that game players develop with computer

graphics could help much in future career. It could, for example, be of particular benefit to children who go on to become engineers or scientists.

Games are also now being developed for pre-school children to encourage reading and writing skills. At Lanterns, a private nursery in east London, computer games make up part of the syllabus. Each week its sixteen pupils — the youngest aged two — are treated to a whirlwind tour of cyberspace. Every day the pupils attend a special class, such as dance or drama, on Tuesdays they have a computer work-shop where they spend an hour playing games. All the children love it. There is no technophobe among them.

III. Look back at the text and complete the phrases below.

1. increase children's power of ____;
2. potentially have a positive effect on children's ____ by encouraging ____ look for greater challenges when they complete tasks;
3. game players think ____ and learn to deal with problems more ____;
4. familiarity with ____ could be useful for ____;
5. can help ____ to learn ____.

IV. In a paragraph of 70-90 words summarise the educational benefits of computer games, according to the author.

Lesson 6. Talking to computers

I. Read the text about voice-controlled computers. Does the writer believe that natural conversation with a computer is a real possibility for the future?

One of the shared assumptions in computer research is that talking to computers is a really great idea. Such a good idea that speech is regarded as the natural interface between human and computer.

Each company with enough money to spare and enough egoism to believe that it can shape everyone's future now has a "natural language" research group. Films and TV series set in the future use computers with voice interfaces to show how far technology has advanced from our own primitive day and age. The unwritten assumption is that talking to your house will in the end be as natural as shouting at your relatives.

The roots of this delusion lie in the genuine naturalness of spoken communication between humans. Meaning is transferred from person to

person so effortlessly that it must be the best way of transferring information from a human to another object.

This view is misguided on many different levels. First people are so good at talking and at understanding what others say because they share a common genetic heritage. Children's brains are hard-wired with a general language structure that their surrounding spoken-word environment suggests. The old view that language is learned by copying parents and other adults has been discredited in recent years, to be replaced by the theory that words are attached to a way that grammar "emerges", as it were, rather than is taught.

This view of human language, added to human experience, shows how people understand each other in a conversation where a transcript would make little sense. Unfinished sentences, in-jokes, catchphrases, hesitation markers like "er" and "you know", and words whose meaning is only clear in the context of that one conversation are no bar to human understanding, but baffled early attempts at computer speech recognition.

Recent advances in artificial intelligence address the problem but only in part.

Linguistic research has revealed much of the underlying structure of human language. Programmers can now mimic that structure in their software and use statistical and other techniques to make up for the lack of shared experience between operator and machine.

Some of the obvious drawbacks of universal voice control have already been encountered. The dreadful prospect of an office full of people talking to their machines has brought about the headset and the throat microphone; these also address the fact that people feel ridiculous talking to something which is non-human. The increasing sophistication of voice-processing and linguistic-analysis tools cut out the dangers in inaccurate responses to input, preventing the computer from having to respond to every single word uttered, no matter how nonsensical it is in the overall context.

The fundamental objection to natural language interfaces is that they are about as unnatural as you can get. You might be able to order a computer about in its limited sphere of action, but it'll never laugh at your jokes, make sarcastic comments or do many other things that make real human conversation so fascinating. If interaction is limited to didactic instruction from human to computer, why use up valuable processing time performing the immensely difficult task of decoding language correctly? To keep your hands free? From what, precisely?

There's another psychological reason why language control is difficult: people that are not accustomed to giving crisp orders and expect them to be obeyed.

Controlling a computer by word power works best if you imitate a drill sergeant, avoiding all "could you's" and "would you mind's" that most of us use when trying to make someone do something they'd rather not do.

II. Answer the following questions.

1. Which word shows that the writer disapproves of the aims and attitudes of large companies? 2. What does the writer mean using the phrases "shared assumptions" and "the unwritten assumptions" when describing how computer researchers view natural language? 3. What has caused "delusion" of researchers? 4. Why do people have no difficulty in understanding one another? 5. What happened to the view that children acquire language by means of imitation? 6. Which phrase summarizes the fundamental problem faced by programmers? 7. How does the writer feel that communication with computers will always be limited? 8. What does the writer imply about attitudes of drill sergeants?

III. Improvements in communication technology mean that people are becoming isolated from one another. Do you think it might be true? What could be done to deal with the problem?

Lesson 7. Will our children read books?

I. Look at the title of the text. What arguments do you think the writer might use to answer the question?

II. Read the text quickly to see if your ideas were included.

Before describing the hierarchy of the arts in the 21st century, it is sensible to recall the experts' forecast for the 20th century. The headline stories were the rise of cinema and then television. And this success, it was assumed, would mean failure for older forms of entertainment and information. Since the 1950s, commentators have frequently predicted that these two new visual giants would eventually destroy theatre, radio, newspapers and books by taking over the functions of these earlier forms or eroding the time available for enjoying them.

In fact, despite the advent of multi-channel, 24-hour TV and multi-screen movie theatres, one can say that only two cultural forms have died in

the past 100 years — concert hall and the letter — and the second of these was killed, not by television but by the telephone, before being somewhat restored by the inventions of the fax machine and e-mail. So cultural story of the 20th century — an epoch of electronic invention and mechanical radicalism — has unexpectedly been that of the durability of traditional and particularly printed forms.

Looking forward then, we should be aware of pessimism's poor record. The book, for example, seems as obvious a candidate for redundancy now as it has since the middle of the 20th century. Where people previously assumed, they now point to computer literacy as the executioner. Yet the book, to an extraordinary degree, has learned to coexist with its visual rivals.

Most Hollywood projects derive from novels: often trashy ones, but also the classics. And not only do movies and television series descend from books, but almost routinely, they return to them as nearly every screen product has its origin in book. It all suggests that the desire of the viewer to follow the visual experience with a print experience is even more tenacious than ever.

The threat to the conventional book in the 21st century is thought subtly different. Where the first challengers were alternatives to reading, the current ones are alternative ways of reading: CD-ROM, computer disk, the Internet, recorded books. The smart money would bet that the standard home or library reference book is going the way of D for Dodo simply because the new technology can make information more visually appealing. But, with regard to fiction, it seems a reasonable assumption that the portability of the standard book and the aesthetic affection that established readers still have for it as a product will confound pessimism in the future.

In fact, the arts most vulnerable to change, at least in Britain, are television and theatre. This is because both depend on state subsidy: a political idea, which must be regarded as highly unlikely to see out the next century. The effect of this will be the increased commercialism of both television and theatre. The casualties will be new theatre writing, the riskier classical repertoire and high-quality television journalism and drama for a general audience, although the last two of these may survive on cable subscription to the middle classes. The rise of television in the 20th century may not, as feared, have killed the book, but the continuing rise of popular television through the 21st century will kill high quality television programming.

The 20th century was starting both for emergence of three new mass cultural pursuits — television, cinema and computers — and for the

survival of the existing ones. This then is the big question for the 21st century. Do we now have our full cultural hand? Might it expand further? Or will there be a showdown between the old and the new? And will our children no longer read books?

III. Answer these questions.

1. What factors could bring about change to “older forms of entertainment and information”? 2. What is the meaning of “advent” in this text? 3. What was the unexpected effect of the fax machine and e-mail? 4. What does the author mean when he mentions the durability of printed forms of communication? 5. How have assumptions about what might discourage people from reading changed? 6. In which way are films actually encouraging people to read? 7. How is the threat to books in the 21st century seen as different from the 20th century? 8. What is the writer’s view about the future of books, and why? 9. What is the big question of the 21st century? 10. Why do pessimists think people would stop reading books, and why have books survived, according to the writer?

IV. How would you answer the question “Will our children read books?”

V. Discuss the two statements and decide which you agree with.

1) “The development of technology and mass media has given young people today a far greater awareness and understanding of culture than their parents.”

2) “People spend so much more time nowadays involved in passive leisure pursuits such as watching television and playing computer games that they have far less interest in cultural activities than their parents and grandparents.”

SUPPLEMENTARY READING

1. Science graduates

Business leaders called today for science graduates to be given a bursary of J1, 000 to help boost the number of specialist workers as the UK gears up for a new “industrial revolution”. The CBI¹ urged the Government to do more to persuade youngsters to study science subjects, tackling the including “misconceptions” about careers in technology and engineering companies. More specialist science teachers were needed, school building and labs should be improved to make the subjects more attractive and

careers advice must be upgraded with J120 million of new funding, urged the business group.

Director general Richard Lambert said youngsters were doing better than ever in science tests at the age of 14, but “hardly any” were going on to study Triple Science at GCSE² level in England. “We need to create an environment in schools that reflects the importance of science, and the value of studying it. We also need to send an unambiguous message to young people who are good at science that science as a career can be fascinating and worthwhile, and will reward you well.” With Mr. Lambert’s aid the UK could be on the verge of a new industrial revolution because of huge new projects such as the J16 billion London Crossrail scheme and the prospect of new nuclear power stations. “The question is whether our fellow citizens will do more than just pour concrete,” said Mr. Lambert, adding that the Crossrail project alone will create jobs for thousands of workers with engineering skills.

The CBI said bright children should automatically be entered for Triple Science at GCSE level, currently taken by just 7% of 16-year-olds. The policy would affect 250,000 14-year-olds every year and would tackle the problem of so many young people “missing out” on a raft of potential careers, Mr. Lambert argued.

The CBI said bursaries of J1,000 should be given to graduates taking science, technology, engineering and maths degrees to help them pay their tuition fees, at a total cost of around J200 million a year.

Science graduates earned at least J60, 000 more over their lifetimes and were in demand, even before the new engineering projects planned in the UK, said the CBI. “If we don’t act we will miss a terrific opportunity and will find ourselves with real problems recruiting skilled workers,” said Mr. Lambert.

An estimated two million extra skilled jobs will be created by the year 2014 in the UK, but firms were already being hit by a shortage of suitably qualified staff, said the CBI. Professor Alan Smithers of the Centre for Education and Employment Research at Buckingham University said: “The CBI is pushing at an open door. The Government has introduced an entitlement from this September. The problem it has is there are not enough physics teachers.”

The problem schools have is in fitting three subjects into a two-subject slot. The separate sciences have continued to thrive in independent schools because their pupils are able to choose any combination at GCSE and do not have to do all three. It could be that state school pupils should be allowed the same freedom as their independent counterparts.

Schools minister Jim Knight said that from September all pupils achieving at least level six at key stage three will be entitled to study triple science GCSE, for example, through collaborative arrangements with other schools. “We think this is the most practical way of building capacity in schools and developing our most promising scientists.

“Increasing the number of young people choosing to study science into higher education is a top priority and it is our goal that every student with the capability should have the option of studying triple science.

“However, we don’t agree that they should be automatically opted.”

Notes

¹.the CBI – The Confederation of British Industry (CBI) is the premier lobbying organisation for UK business.

².GCSE - The General Certificate of Secondary Education (GCSE) is the name of an academic qualification awarded in a specified subject, generally taken in a number of subjects by students aged 13-16 in secondary education in England, Wales, and Northern Ireland.

2. Bill Gates

William Henry “Bill” Gates III was born in Seattle, Washington, in 1955.

He is an American business executive, author, chairman and chief executive officer of the software company Microsoft Corporation. Gates was the founder of Microsoft in 1975 together with Paul Allen, his partner in computer language development. While attending Harvard in 1975, Gates together with Allen developed a version of the BASIC¹ computer programming language for the first personal computer.

In the early 1980s, Gates led Microsoft’s evolution from the developer of computer programming languages to a large computer software company. This transition began with the introduction of MS-DOS², the operating system for the new IBM³ Personal Computer in 1981. Gates also led Microsoft towards the introduction of application software such as the Microsoft Word Processor.

He is ranked consistently one of the world’s wealthiest people and the wealthiest overall as of March 2009. During his career at Microsoft, Gates held the positions of CEO⁴ and chief software architect, and remains the largest individual shareholder with more than 8 percent of the common stock. He has also authored or co-authored several books.

Bill Gates stepped down as chief executive officer of Microsoft in January, 2000. He remained as chairman and created the position of chief software architect. In June, 2006, Gates announced that he would be

transitioning from full-time work at Microsoft to part-time work and full-time work at the Bill & Melinda Gates Foundation. He gradually transferred his duties to Ray Ozzie, chief software architect and Craig Mundie, chief research and strategy officer. Gates's last full-time day at Microsoft was June 27, 2008. He remains at Microsoft as non-executive chairman.

Notes

¹BASIC — сокр. от *Beginners All-purpose Symbolic Instruction Code* — Бейсик (язык программирования высшего уровня, используемый в программировании для простых вычислений);

²MS-DOS — сокр.от *Microsoft Disk Operation System* — дисковая операционная система компании «Майкрософт»;

³IBM — сокр. от *International Business Machine*— компания IBM — производитель аппаратного и программного обеспечения, а также принадлежащая ей торговая марка;

⁴CEO — сокр. от Chief Executive Officer — (главный) исполнительный директор; генеральный директор (корпорации)

3. Simple Windows tweaks to improve performance

Windows XP and Vista are excellent operating systems, but the default settings they are installed with do not necessarily promote the optimum performance of your computer system. Some machines are powerful enough that there is no noticeable performance trade-off in running Windows as installed, however, many if not most systems could see a big increase in performance by simply tweaking Windows for best performance.

Additionally, over time, Windows can become sluggish due to cluttered computer memory, loads of application programs, pop-ups, viruses, and spyware. The following are some simple steps you can take to improve your Windows experience:

1. *Regularly Install Software Patch Updates.* Microsoft frequently provides software patches and updates to improve performance and remove defects in its programs. Ensure that you have the latest patches and updates for your operating system. Check Microsoft Windows Update for the latest patches and updates available.

2. *Run Fewer Applications at the Same Time.* Sometimes little things like simply changing the way you use your computer can have a decent impact on the performance of Windows. If you typically run several MS Office programs at the same time, have multiple Internet Browser windows open at the same time, are chatting and emailing with friends, all the while

listening to music at the same time, you will be eating up a large chunk of your PC's resources thus slowing performance down significantly. Look for ways to reduce your own multi-tasking to increase your overall Windows speed and performance.

3. *Delete the Temporary Files in your Operating System.* Over time the Windows Temp directory can get filled up with application files that it stores there regularly. Large amounts of data and files can accumulate in this directory and have an impact on the performance of your operating system. The best way to find and delete these temp files is to go to your Windows Explorer and do a search of your local disk C: for all temp files. Just enter *.tmp into the search box and press Enter. Sort by the Date Modified tab at the top and delete any temp files that are older than a few weeks.

4. *Get Rid of That Annoying Windows Messenger at Startup.* Windows, by default, will load this program every time you boot up your system. If you do not use this program or do not want it to load automatically, it can be extremely frustrating to disable it. Here is what you need to do to disable it: Go to the Group Policy Editor by clicking Start, then Run and typing gpedit.msc into the text box and click OK. Scroll down the menu to Local Computer Policy, then select Computer Configuration followed by Administrative Templates, next select Windows Components and finally Windows Messenger. You will next change the settings in Do not allow Windows Messenger to be run and Do not automatically start Windows Messenger initially by double clicking on each one and selecting Enabled. Simply reboot your system and you will no longer be bothered by the auto start of Windows Messenger.

5. *Defragment Your Computer Hard Drive Weekly.* Windows speed and performance can diminish over time due to delays in accessing your files and programs on the hard drive. The cause of this is defragmentation of the file structure on your hard drive by saving and deleting files, creating and deleting folders, and installing and uninstalling programs. Windows operating systems come equipped with a defrag tool which you can access by clicking Start, then All Programs. Find and click Accessories, then select System Tools and click on Disk Defragmenter. Again, ensure to perform this task weekly or setup automatic scheduling of this task to be performed by Windows weekly if it is not already setup to do so.

4. Considerations before buying new computer hardware

While software is needed to make any hardware useful, without the correct hardware your software may not run efficiently or even at all. Therefore you should purchase your computer hardware with care.

Before buying computer hardware, you have a number of things to consider.

Perhaps the most important thing you must think about is what benefits you want the new hardware to bring to you. You cannot choose the right hardware unless you know exactly what you want it to do for you.

Once you have listed the key hardware investments you could make, prioritise them and see which you can afford now, and which can wait.

Then make sure any new hardware is compatible with existing computer equipment. You may need to upgrade or replace some of your current equipment to make the most of your new investments. Investigate the costs, as it may be cost-effective to install a whole new system.

Don't just focus on your current needs — look at your plans for the future and any expansion this might involve. Ideally you should develop an IT strategy to cover your needs for new systems over a period of about five years. Bear in mind that, if you decide to invest in new software, your hardware may need upgrading in order to run it.

Choosing desktop computer hardware you should know that there are two types of computer that you might need for your needs — desktop PCs and laptops.

If you carry out all your work in one place, a desktop computer will meet your needs and will offer the best price for a given level of performance. Desktop PCs are generally more durable than laptops.

Desktop PCs can generally be repaired and upgraded by local PC shops using standard off-the-shelf components. This can extend their life considerably. Laptops are more difficult to repair and may need to be returned to the supplier. If you need to use a computer while away from your home, a laptop can be invaluable.

Printers are essential for most businesses. There are three basic types of printer. Laser printers produce colour or black and white pages and are suitable for most printing needs. They are more expensive than other types of printers but are more economical if you do lots of printing and are relatively fast. Inkjet printers are used for either colour or black and white printing. Some inkjet printers can produce photographic quality images. Although cheap to purchase, inkjet supplies, like paper and ink, make them expensive per page printed. They are also slower than comparable laser printers. Impact printers, such as dot matrix printers, are now rarely used

except for special purposes, e.g. for printing forms used with accounts packages.

Scanners are used to capture images digitally. They can be useful in an office for storing content digitally that is only available in print and for extracting text from documents such as books. Scanners can be connected directly to a desktop PC. If you need a printer, a photocopier, a fax machine and perhaps a scanner you should buy a multi-function device. These have several advantages: the total cost may be lower than the combined cost of separate units and it saves desk space. Disadvantages of such devices are that they may not deliver all the performance available from separate units and, if they fail, you lose all the functions at once and will need to replace the entire unit.

5. Introduction to quantum computer operation

The massive amount of processing power generated by computer manufacturers has not yet been able to quench our thirst for speed and computing capacity. In 1947, American computer engineer Howard Aiken said that just six electronic digital computers would satisfy the computing needs of the United States. Others have made similar errant predictions about the amount of computing power that would support our growing technological needs. Of course, Aiken didn't count on the large amounts of data generated by scientific research, the proliferation of personal computers or the emergence of the Internet, which have only fueled our need for more, more and more computing power.

Will we ever have the amount of computing power we need or want? If, as Moore's Law states, the number of transistors on a microprocessor continues to double every 18 months, the year 2020 or 2030 will find the circuits on a microprocessor measured on an atomic scale. And the logical next step will be to create quantum computers, which will harness the power of atoms and molecules to perform memory and processing tasks. Quantum computers have the potential to perform certain calculations significantly faster than any silicon-based computer.

Scientists have already built basic quantum computers that can perform certain calculations; but a practical quantum computer is still years away.

You don't have to go back too far to find the origins of quantum computing. While computers have been around for the majority of the 20th century, quantum computing was first theorized less than 30 years ago, by a physicist at the Argonne National Laboratory. Paul Benioff is credited with first applying quantum theory to computers in 1981. Benioff

theorized about creating a quantum Turing machine. Most digital computers, like the one you are using to read this article, are based on the Turing theory.

Defining the quantum computer

The Turing machine, developed by Alan Turing in the 1930s, is a theoretical device that consists of tape of unlimited length that is divided into little squares. Each square can either hold a symbol (1 or 0) or be left blank. A read-write device reads these symbols and blanks, which gives the machine its instructions to perform a certain program. Does this sound familiar? Well, in a quantum Turing machine, the difference is that the tape exists in a quantum state, as does the read-write head. This means that the symbols on the tape can be either 0 or 1 or a superposition of 0 and 1; in other words the symbols are both 0 and 1 (and all points in between) at the same time. While normal Turing machine can only perform one calculation at a time, a quantum Turing machine can perform many calculations at once.

Today's computers, like a Turing machine, work by manipulating bits that exist in one of two states: a 0 or a 1. Quantum computers aren't limited to two states; they encode information as quantum bits, or qubits, which can exist in superposition. Qubits represent atoms, ions, photons or electrons and their respective control devices that are working together to act as computer memory and a processor. Because a quantum computer can contain these multiple states simultaneously, it has the potential to be millions of times more powerful than today's most powerful supercomputers.

This superposition of qubits is what gives quantum computers their inherent parallelism. According to physicist David Deutsch, this parallelism allows a quantum computer to work on a million computations at once, while your desktop PC works on one. A 30-qubit quantum computer would equal the processing power of a conventional computer that could run at 10 teraflops (trillions of floating-point operations per second). Today's typical desktop computers run at speeds measured in gigaflops (billions of floating-point operations per second).

Researchers at IBM — Almaden Research Center — developed what they claimed was the most advanced quantum computer. The 5-qubit quantum computer was designed to allow the nuclei of five fluorine atoms to interact with each other as qubits, be programmed by radio frequency pulses and be detected by NMR instruments similar to those used in hospitals. Led by Dr. Isaac Chuang, the IBM team was able to solve in one step a mathematical problem that would take conventional

computers repeated cycles. The problem, called order-finding, involves finding the period of a particular function, a typical aspect of many mathematical problems involved in cryptography.

Qubit control

Computer scientists control the microscopic particles that act as qubits in quantum computers by using control devices.

Ion traps use optical or magnetic fields (or a combination of both) to trap ions.

Optical traps use light waves to trap and control particles.

Quantum dots are made of semiconductor material and are used to contain and manipulate electrons.

Semiconductor impurities contain electrons by using “unwanted” atoms found in semiconductor material.

Superconducting circuits allow electrons to flow with almost no resistance at very low temperatures.

Today's quantum computers

Quantum computers could one day replace silicon chips, just like the transistor once replaced the vacuum tube. But for now, the technology required to develop such a quantum computer is beyond our reach. Most research in quantum computing is still very theoretical.

The most advanced quantum computers have not gone beyond manipulating more than 16 qubits, meaning that they are far from practical application. However, the potential remains that quantum computers one day could perform, quickly and easily, calculations that are incredibly time-consuming on conventional computers. Several key advancements have been made in quantum computing in the last few years. Let's look at a few of the quantum computers that have been developed.

2000. In March, scientists at Los Alamos National Laboratory announced the development of a 7-qubit quantum computer within a single drop of liquid. The quantum computer uses nuclear magnetic resonance (NMR) to manipulate particles in the atomic nuclei of molecules of trans-crotonic acid, a simple fluid consisting of molecules made up of six hydrogen and four carbon atoms. The NMR is used to apply electromagnetic pulses, which force the particles to line up. These particles in positions parallel or counter to the magnetic field allow the quantum computer to mimic the information-encoding of bits in digital computers.

2001. Scientists from IBM and Stanford University successfully demonstrated Shor's Algorithm on a quantum computer. Shor's

Algorithm is a method for finding the prime factors of numbers, which plays an intrinsic role in cryptography. They used a 7-qubit computer to find the factors of 15. The computer correctly deduced that the prime factors were 3 and 5.

2005. The Institute of Quantum Optics and Quantum Information at the University of Innsbruck announced that scientists had created the first qubyte, or series of 8 qubits, using ion traps.

2006. Scientists in Waterloo and Massachusetts devised methods for quantum control on a 12-qubit system. Quantum control becomes more complex as systems employ more qubits.

2007. Canadian company D-Wave demonstrated a 16-qubit quantum computer. The computer solved a sudoku puzzle and other pattern matching problems. The company claims it will produce practical systems. Skeptics believe practical quantum computers are still decades away, that the system D-Wave has created isn't scaleable, and that many of the claims on D-Wave's Web site are simply impossible.

If functional quantum computers can be built, they will be valuable in factoring large numbers, and therefore extremely useful for decoding and encoding secret information. If one were to be built today, no information on the Internet would be safe. Our current methods of encryption are simple compared to the complicated methods possible in quantum computers. Quantum computers could also be used to search large databases in a fraction of the time that it would take a conventional computer. Other applications could include using quantum computers to study quantum mechanics, or even to design other quantum computers.

But quantum computing is still in its early stages of development, and many computer scientists believe the technology needed to create a practical quantum computer is years away. Quantum computers must have at least several dozen qubits to be able to solve real-world problems, and thus serve as a viable computing method.

Notes

To quench our thirst – утолить нашу жажду; *similar errant predictions* – подобные расплывчатые предсказания; *have only fueled our needs* – дало новый импульс нашим потребностям; *will harness the power of atoms and molecules* – задействуют энергию атомов и молекул; *is credited with first applying quantum theory* – признается первым, кто применил квантовую теорию; *superposition* – совмещенное состояние; *multiple states* – многократные состояния; *trans-crotonic acid* – транс-кротонная кислота; *fluorine* – фтор; *prime factors* – основные множители; *ion trap* – ионная ловушка.

6. Computerized tomography

It is an imaging technique which uses an array of detectors to collect information from a beam that has passed through an object (for example, a portion of the human body). The information collected is then used by a computer to reconstruct the internal structures, and the resulting image can be displayed – for example, on a television screen. The technique relies on the fact that wave phenomena can penetrate into regions where it is impossible or undesirable to introduce ordinary probes.

In medicine, computerized tomography represents a noninvasive way of seeing internal structures. In the brain, for example, computerized tomography can readily locate tumors and hemorrhages, thereby providing immediate information for evaluating neurological emergencies. Another advantage of computerized tomography is three-dimensional reconstruction. It is most useful in cases of fracture of the hip or facial bones, helping the surgeon to do reconstructive surgery. Other medical imaging techniques that make use of computerized tomographic methods include magnetic resonance imaging, positron emission tomography, and single-photon emission tomography.

After the success of computerized tomography in medicine, its possibilities in other fields were quickly realized. In the earth, atmospheric, and ocean sciences it has supplemented, but no means replaced, older methods of remote sensing. Seismic tomography is now an important tool for investigating the deep structure of the Earth, testing theories such as plate tectonics, and exploring for oil. Ocean acoustic tomography is applied to physical oceanography, climatology, and antisubmarine warfare. Atmospheric tomography finds applications to weather, climate and the environment.

Notes

Plate tectonics – тектоника плит (современная геологическая теория о движении земной коры и мантии)

7. Character recognition

The process of converting scanned images of machine-printed or handwritten text (numerals, letters, and symbols) into a computer-processable format also known as optical character recognition (OCR). A typical OCR system contains three logical components: an image scanner, OCR software and hardware, and an output interface. The image scanner optically captures text images to be recognized. Text images are processed with OCR software and hardware. The process involves three operations: documents analysis (extracting individual character images), recognizing these images (based on shape), and contextual processing (either to

correct misclassifications made by the recognition algorithm or to limit recognition choices). The output interface is responsible for communication of OCR system results to the outside world.

Commercial OCR systems can largely be grouped into two categories: task-specific readers and general-purpose page readers. A task-specific reader handles only specific document types. Some of the most common task-specific readers read bank checks, letter mail, or credit-card slips. General-purpose page readers are designed to handle a broader range of documents such as business letters, technical writings and newspapers.

Notes

General-purpose page reader – универсальное устройство для считывания страниц

8. Plastic logic e-newspaper

Plastic Logic, a spin-off company from the Cambridge University's Cavendish Laboratory, has recently released its design of a future electronic newspaper reader. This lightweight plastic screen copies the appearance, but not the feel, of a printed newspaper. This electronic paper technology was pioneered by the E-Ink Corporation and is used in the current generation Sony eReader and Amazon.com's Kindle. Plastic Logic's device, yet to be named, has a highly legible black-and-white display and a screen more than twice as large compared to current versions available on the market.

Plastic Logic's new device has an A4 sized display, can be continually updated via a wireless link, and can store and display hundreds of pages of newspapers, books, and documents. Richard Archuleta, the chief executive of Plastic Logic, said the display was Amazon Kindle sufficiently large enough to match a newspaper's layout. "Even though we have positioned this for business documents, newspapers are what everyone asks for," said Archuleta.

Another company vying to control the e-newspaper market is the Hearst Corporation. They own 16 daily newspapers, including the Houston Chronicle, the San Antonio Express, and the San Francisco Chronicle. Hearst was also an early investor in E-Ink, using this technology and to distribute electronic versions of some papers on Amazon's Kindle.

The advancement of colour displays with moving images and interactive clickable advertisements would be available within a few more years. However, the ideal format of the flexible display which could be rolled or folded like a newspaper still has many years of development ahead.

At E-Ink's headquarters recently, a demonstration was held showing prototypes of flexible displays that exhibit rudimentary colors and animated images. "By 2010, we will have a production version of a display that offers newspaper like colour," said Peruvemba. He also expects technology allowing users to write on the screen and view videos to be available within the next few years.

E-Ink's technology, commonly known as electronic paper (e-paper), is different from liquid-crystal display (LCD) used in modern computer monitors and televisions. This e-paper technology does not use a backlight and consumes power only when the content of the display changes. Contrasting to current display panels, which are barely visible in strong light, the e-paper's display will look even brighter in daylight.

Compared to Amazon's Kindle, Plastic Logic's first display is 2.5 times larger and is only one-third of the Kindle's thickness. However, it weighs two ounces more than Kindle, even though it uses a flexible, lightweight plastic as its cover. The display is expected to be on sale in the first half of 2009, according to the company.

Notes

Spin-off company - фирма, отделившаяся от материнской компании (с целью коммерческой реализации нового научно-технического достижения); *Amazon Kindle* is a software and hardware platform for reading electronic books (*e-books*), first launched in the *United States* on November 19, 2007. *newspaper's layout* – формат газеты; *another company vying* - еще одна компания претендует; *liquid-crystal display* - жидкокристаллический дисплей

9. Embedded computers

The most common form of computer in use today is the embedded computer. Embedded computers are small, simple devices that are used to control other devices — for example, they may be found in machines ranging from fighter aircraft to industrial robots, digital cameras, and children's toys.

A fighter aircraft is a military aircraft designed primarily for air-to-air combat with other aircraft, as opposed to a bomber, which is designed primarily to attack ground targets by dropping bombs. Fighters are comparatively small, fast, and maneuverable. Many fighters have secondary ground-attack capabilities, and some are dual-rolled as fighter-bombers; the term "fighter" is also sometimes used colloquially for dedicated ground-attack aircraft. Fighter aircraft are the primary means by which armed forces gain air superiority over their opponents above a

particular battle space. Since at least World War II, achieving and maintaining air superiority has been a key component of victory in most modern warfare, particularly conventional warfare between regular armies (as opposed to guerrilla warfare), and the acquisition, training and maintenance of a fighter fleet represent a very substantial proportion of defense budgets for modern militaries.

Today is the age of the fifth-generation fighters which are characterized by being designed from the start to operate in a network-centric combat environment, and to feature extremely low, all-aspect, multi-spectral signatures employing advanced materials and shaping techniques. They have multifunction AESA radars¹ with high-bandwidth, low-probability of intercept (LPI) data transmission capabilities.IRST sensors² are incorporated for air-to-air combat as well as for air-to-ground weapons delivery. These sensors, along with advanced avionics, glass cockpits, helmet-mounted sights, and improved secure, jamming-resistant LPI datalinks³ are highly integrated to provide multi-platform, multi-sensor data fusion for vastly improved situational awareness while easing the pilot's workload. Avionics suites rely on extensive use of very high-speed integrated circuit (VHSIC) technology, common modules, and high-speed data bases. Other technologies common to this latest generation of fighters includes integrated electronic warfare system (INEWS) technology, integrated communications, navigation, and identification avionics technology, centralized "vehicle health monitoring" systems for ease of maintenance, and fiber optics data transmission. Overall, the integration of all these elements is claimed to provide fifth-generation fighters with a "first-look, first-shot, first-kill capability".

Notes

¹*AESA radars* — An Active Electronically Scanned Array (AESA), also known as active phased radar is a type of radar whose transmitter and receiver functions are composed of numerous small transmit/receive (T/R) modules. AESA radars feature short to instantaneous (millisecond) scanning rates and have a desirable low probability of intercept.

²*IRST sensors* — An infra-red search and track (IRST) system (sometimes known as infra-red sighting and tracking) is a method for detecting and tracking objects which give off infrared radiation such as jet aircraft and helicopters.

³*LPI datalinks* — Low-Probability-of-Intercept datalinks

Avionics — авиационная радиоэлектроника; *embedded computer* — встроенный компьютер; *fighter aircraft* — самолет-истребитель; *combat*

– бой; *bomber* – бомбардировщик; *colloquially* – в просторечии; *to maintain* – поддерживать; *warfare* – война; *guerrilla warfare* – партизанская война; *acquisition* – приобретение; *glass cockpit* – стеклянная кабина; *jam* – заклинивание, заедание; *fusion* – сплав, слияние; *awareness* – понимание; *workload* – рабочая нагрузка; *to feature* – показывать

10. The cell phone as the computer

If you had been told ten years ago that by the end of 2007 there would be an international network of wirelessly-connected computers throughout the developing world, you might well have said it wasn't possible. But it's possible, and it is created, and it continues to expand.

We are talking, of course, about the mobile phone network.

Along with the internet, with which it is rapidly merging, this is the most astonishing technology story of our time, and one that has the power to revolutionise access to information across the developing world.

Imagine a system that lets managers at a national level, who probably do have access to the internet on a desktop computer, coordinate and transmit SMS-based continuing education messages to the computers — sorry, to the cell phones — of those health professionals. What a difference would that make to the level of up-to-date knowledge available to a clinic worker? And how would that impact the quality of care?

And what other groups might benefit from that kind of educational program? What about teachers? What about students?

So, it's time that we recognised that for the majority of the world's population, and for the foreseeable future, the cell phone is the computer, and the portal to the Internet, and the communications tool, and the schoolbook, and the vaccination record, and the family album, and many other things, just as soon as someone, somewhere, sits down and writes the software that allows these functions to be performed.

11. Using your voice to pilot your computer

An interdisciplinary team of scientists of the University of Washington (UW) has developed Vocal Joystick, a software which enables people with disabilities to control their computers using the sound of their voice and without the need to use a mouse. Their virtual computer mouse driven by sound has already been tested at the UW Medical Center with spinal-cord-injury patients and other participants with varying levels of disabilities. The researchers, who developed their own voice-recognition

technology, hope to have a prototype available online this fall. But read more...

So how does this software work? Here are some short excerpts from the *Seattle Times* mentioned in the introduction. “There are several options for people who needed accommodations in using computers, but the UW software is distinguished on several levels. For one, it doesn’t use standard voice-recognition technology. Instead, it detects basic sounds at about 100 times a second and harnesses them to generate fluid, adaptive cursor movement. Vocal-joystick researchers maintain the system is easier to use because it allows users to exploit a large set of sounds for both continuous and discrete movement and to make visual adjustments on the fly. Kurt L. Johnson, a professor in the Department of Rehabilitation Medicine at the UW, says he believes the software has great potential because it is easy to both learn and use.

Here are some more details about the Vocal Joystick voice-recognition technology engine. “The VJ system consists of three main components: acoustic signal processing, pattern recognition and motion control. First, the signal processing module extracts short-term acoustic features, such as energy, autocorrelation coefficients, linear prediction coefficients and mel frequency cepstral coefficients (MFCC). Signal conditioning and analysis techniques are needed for accurate estimation of these features. Next, these features are piped into the pattern recognition module, where energy smoothing, pitch and formant tracking, vowel classification and discrete sound recognition take place. This stage involves statistical learning techniques such as neural networks and dynamic Bayesian networks. Finally, energy, pitch, vowel quality and discrete sound become acoustic parameters to be transformed into direction, speed and other motion related parameters. The application driver takes the motion control parameters and launches corresponding actions.”

Notes

Vocal Joystick - голосовой координатный манипулятор; *spinal-cord-injury patients* - пациенты с повреждением спинного мозга; *voice recognition technology* - технология распознавания голоса; *harnesses* - аккумулирует; *autocorrelation coefficients* - коэффициент взаимозависимости.

12. MEMS — microelectromechanical system

Interest in creating MEMS grew in the 1980s, but it took nearly two decades to establish the design and manufacturing infrastructure needed for

their commercial development. One of the first products with a large market was the automobile air-bag controller, which combines inertia sensors to detect a crash and electronic control circuitry to deploy the air bag in response. Another early application for MEMS was in inkjet printheads. In the late 1990s, following decades of research, a new type of electronic projector was marketed that employed millions of micromirrors, each with its *own* electronic tilt control, to convert digital signals into images that rival the best traditional television displays. Emerging products include mirror arrays for optical switching in telecommunications, semiconductor chips with integrated mechanical oscillators for radio-frequency applications (such as cellular telephones), and broad range of biochemical sensors for use in manufacturing, medicine, and security.

MEMS are fabricated by using the processing tools and materials employed in integrated-circuit (IC) manufacturing. Typically, layers of polycrystalline silicon are deposited along with the so-called sacrificial layers of silicon dioxide or other materials. The layers are patterned and etched before the sacrificial layers are dissolved to reveal three-dimensional structures, including microscopic cantilevers, chambers, nozzles, wheels, gears, and mirrors. By building these structures with the same batch-processing methods used in IC manufacturing, with many MEMS on a single silicon wafer significant economies of scale have been achieved. Also, the MEMS components are in essence “built in place”, with no subsequent assembly required, in contrast to the manufacture of conventional mechanical devices.

A technical issue in MEMS fabrication concerns the order in which to build the electronic and mechanical components. High-temperature annealing is needed to relieve stress and warping of the polycrystalline-silicon layers, but it can damage any electronic circuits that have already been added. On the other hand, building the mechanical components first requires protecting these parts while the electronic circuitry is fabricated. Various solutions have been used, including burying the mechanical parts in shallow trenches prior to the electronics fabrication and then uncovering them afterward.

Barriers to further commercial penetration of MEMS include their cost compared with the cost of simpler technologies, nonstandardization of design and modeling tools, and the need for more reliable packaging. A current research focus is on exploring properties at nanometer dimensions (i. e., at billionths of a meter) for devices known as nanoelectromechanical systems (NEMS). At these scales the frequency of oscillation for structures increases (from megahertz up to gigahertz frequencies), offering new

design possibilities (such as for noise filters); however, the devices become increasingly sensitive to any defects arising from their fabrication.

Notes

The automobile air-bag controller — контроллер автомобильной воздушной подушки; *inkjet printheads* — струйные головки; *own electronic tilt control* — собственный электронный контроль наклона; *layers of silicon dioxide* — слои двуокиси кремния; *a single silicon wafer* — единственная силиконовая пластина; *high-temperature annealing* — высоко-температурный обжиг; *shallow trenches* — узкие канавки.

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