**МІНІСТЕРСТВО ОСВІТИ І НАУКИ УКРАЇНИ**

**ТЕРНОПІЛЬСЬКИЙ НАЦІОНАЛЬНИЙ ЕКОНОМІЧНИЙ УНІВЕРСИТЕТ**

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**АНГЛІЙСЬКА МОВА**

**(для студентів спеціальностей галузі знань   
«Інформаційні технології»)**

**(Навчальний посібник для студентів**

**вищих навчальних закладів ІІІ-ІV рівнів акредитації)**

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Посібник призначений для студентів вищих навчальних закладів, що спеціалізуються у галузі «Інформаційні технології», а також фахівців, які прагнуть удосконалити власний рівень професійної іншомовної компетенції.

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**CONTENT**

**INTRODUCTION**…………………………………………………………….5

**UNIT 1. A SIMPLE COMPUTER: HARDWARE DESIGN**

1.1. Computer evolution 6

Grammar: present simple vs present continuous

1.2. Input devices 9

Grammar: instructions and advice

1.3. Output devices 12

Grammar: countable and uncountable nouns

1.4. New trends in Input/Output technology 18

Grammar: present perfect vs. past simple

1.5. CPU 21

Grammar: comparatives

1.6. Types of memory 24

Grammar: connectors

**UNIT 2. COMPUTER SOFTWARE**

2.1. The operating system 29

Grammar: adverbs

2.2. Word processing 32

Grammar: expressing the use and function of a device

2.3. Databases 35

Grammar: word building

2.4. Graphics and design 39

Grammar: phrasal verbs

2.5. Multimedia 44

Grammar: prefixes in IT-terminology

**UNIT 3. INFORMATION SYSTEMS**

3.1. Types of information systems 47

Grammar: present perfect simple vs present perfect continuous

3.2. System development 51

Grammar: past perfect

3.3. Structured system development 54

Grammar: modals need, ought

3.4. Information engineering 57

Grammar: ways of contrasting ideas

3.5. The object-oriented approach 60

Grammar: future simple, future perfect

3.6. Programming languages 64

Grammar: past continuous vs past perfect continuous

**UNIT 4. COMPUTER NETWORKS AND THE INTERNET**

4.1. Computer networks 68

Grammar: Passive

4.2. Network topology 72

Grammar: Modals with Passive Infinitive

4.3. What are the Internet and the World Wide Web? 75

Grammar: Participle

4.4. Internet and Web-based application architecture 80

Grammar: Participle, gerund, adjective

4.5. Neural networks 84

Grammar: Conditionals

**UNIT 5. MANAGING IT: SECURITY AND ETHICAL CHALANGES**

5.1. Internet security 88

Grammar: unless, provided/providing

5.2. Integrity controls to prevent fraud 92

Grammar: modals: can, could; may, might; should, must, have to

5.3. Security for access to systems 96

Grammar: be able to, be allowed (to), be permitted (to), be prohibited from

5.4. Secure transactions..............................................................................100

Grammar: relative clauses with who, that, which

5.5. Information ethics 104

Grammar: questions

**UNIT 6. COMPUTERS TODAY AND TOMORROW**

# 6.1. Artificial Intelligence 108

# Grammar: choosing active or passive

# 6.2. Virtual Reality 111

# Grammar: phrasal verbs; -ing forms

6.3. Current trends in system development 115

Grammar: infinitive

6.4. Applications of nanotechnology 119

Grammar: passive reporting structures

6.5. Gestural interfaces 122

Grammar: to be/get used to

**Useful language for technical writing** ……………………………………...127

**Abbreviations** 129

**Phrasal verbs**  132

**English-Ukrainian Glossary** 133

**Bibliography** 146

**ПЕРЕДМОВА**

Сьогодні розширення міжнародних зв’язків, розвиток науково-технічного прогресу, інтернетизація знань забезпечують доступ до різноманітної інформації іноземними мовами, зокрема англійською. Основною метою вивчення іноземної мови у вищому навчальному закладі є досягнення студентами практичного рівня оволодіння мовою, який дозволяє здійснювати комунікацію у різноманітних сферах професійно-зорієнтованої діяльності. Оскільки змістовий аспект комунікації зумовлений сферами людської діяльності, саме професійна спрямованість є основою відбору мовного та мовленнєвого матеріалу пропонованого посібника.

Навчальний посібник репрезентує інноваційну концепцію удосконалення професійно-мовленнєвого рівня майбутніх фахівців галузі знань «Інформаційні технології» у процесі їх гуманітарної підготовки. Наскрізною ідеєю цієї концепції виступає ідея становлення майбутнього ІТ-фахівця як мовної особистості, здатної до трансляції та інтерпретації думки фахового мовлення у певній мовній системі координат.

Посібник складено на основі компетентнісного, інтегративного та комунікативного підходів до вивчення іноземної мови. Структура посібника охоплює шість тематичних розділів, кожен з яких містить п’ять-шість підрозділів. Пропоновані авторами тексти, взяті з автентичних джерел, є частково адаптовані і відображають сучасні тенденції розвитку ІТ-технологій. Робота з текстами передбачає розвиток навичок інтерпретації і трансляції фахової літератури і відповідно спрямована на удосконалення професійних знань студентів. Кожний наступний текст продовжує логіко-семантичний комплекс, засвоєний студентами з попереднього тексту, що допомагає їх розуміти смислове значення тексту та збагачувати індивідуальний фаховий лексикон.

Для ефективного засвоєння змісту посібника авторами складено англо-український тематичний словник та список уживаних скорочень, які використовуються в ІТ-галузі. Розроблена система граматичних і лексичних вправ спрямована на формування професійної іншомовної компетенції майбутніх ІТ-фахівців.

**UNIT 1. A SIMPLE COMPUTER: HARDWARE DESIGN**

**1.1. Computer evolution**

**1.2. Input devices**

**1.3. Output devices**

**1.4. New trends in Input/Output technology**

**1.5. CPU**

**1.6. Types of memory**

**1.1. COMPUTER EVOLUTION**

*SPEAKING AND VOCABULARY: COMPUTERS*

*1. Continue the following sentences (1 – 5), choosing their correct endings (a – e).*

1. Englishman Charles Babbage developed the difference engine, a mechanical device

2. Commercial computer system development has followed

3. Because of the enormous size, unreliability, and high cost of these computers,

4. Minicomputers were regarded as dedicated application machines

5. Such systems might communicate with users and programmers in

a) many people assumed they would remain very expensive, specialized tools, not destined for general use.

b) the development of hardware technology.

c) with limited processing capability compared to that of large scale machines.

d) that carried out a sequence of computations specified by the setting of levers, gears and cams.

e) natural languages, rather than in specialized computer languages.

*2. Read the text and answer these questions:*

1. When were mechanical calculators developed?

2. How many computer generations do you know today?

3. What are the peculiarities of first-generation machines?

4. What were the advantages of the second generation transistors?

5. What technology was used in the third-generation computers?

6. What generation development are we witnessing now?

**COMPUTER GENERATIONS**

Man has always been in search of mechanical aids for computation. In 17th century France, Pascal and Leibnitz developed mechanical calculators that were later developed into desk calculators. In 1801, Jacquard used punched cards to instruct his looms in weaving various patterns on cloth.

In 1822, Englishman Charles Babbage developed the difference engine, a mechanical device that carried out a sequence of computations specified by the setting of levers, gears and cams. Data were entered manually as the computation progressed. Around 1820, Babbage proposed the analytical engine, which would use a set of punched cards for program input, another set of cards for data input, and a third set of cards for output of results. The mechanical technology was not sufficiently advanced and the analytical engine was never built; nevertheless, the analytical engine as designed probably was the first computer in the modern sense of the word.

Commercial computer system development has followed the development of hardware technology and is usually divided into four generations.

*First generation (1951 – 1958) – Vacuum tube technology*

First-generations machines (UNIVAC I, IBM 701) built out of vacuum tubes were slow and bulky and accommodated a limited number of input/output devices. Magnetic tape was the predominant I/O medium. Data access time was measured in milliseconds. Another drawback was that the language, used in programming was machine language, which uses numbers, rather than the present-day higher-level languages, which are more like English. Programming with numbers alone made using of the computer difficult and time-consuming. Because of the enormous size, unreliability, and high cost of these computers, many people assumed they would remain very expensive, specialized tools, not destined for general use.

*Second generation (1959 – 1964) – Transistor Technology*

Second-generation machines (IBM 1401, 7090; RCA501; CDC 6600; Burroughs 5500; DEC PDP-1) used random access core memories, transistor technology, multifunctional units and multiple processing units. Data access time was measured in microseconds. Assembler and high-level languages were developed.

The transistor revolutionized electronics in general and computer in particular. Not only did transistors shrink the size of the vacuum tube – but they also had numerous other advantages: they needed no warm-up time, consumed less energy, and were faster and more reliable.

*Third generation (1965 – 1970) – Integrated circuit technology*

The integrated circuit technology used in third-generation machines such as IBM 360, UNIVAC 1108, ILLIAC-IV and CDC STAR-100 contributed to nanosecond data access and processing times. Multiprogramming, array and pipe-line processing concepts came into being.

Computer systems were viewed as general-purpose data processors until the introduction in 1965 of DEC PDP-8, a minicomputer. Minicomputers were regarded as dedicated application machines with limited processing capability compared to that of large scale machines.

*Fourth Generation (1971 – Present) – Microprocessor technology*

Fourth-generation computing relies on the use of LSI (large-scale integration) and VLSI (very large scale integration) technologies that cram hundreds of thousands or millions transistors and other circuit elements on each chip. This enabled the development of *microprocessors*, in which all of the circuits of a CPU are contained on a single chip with processing speeds of millions of instructions per second.

We are now witnessing the development of *fifth-generation systems*. There is no accepted definition of a fifth-generation computer. The fifth-generation computer systems are expected to make extensive use of the techniques of artificial intelligence, which simulate some aspects of human thought. Such systems might communicate with users and programmers in natural languages, rather than in specialized computer languages. They might solve problems without having to be told step-by-step how to arrive at the solution. Instead, they would draw on knowledge and problem-solving techniques previously collected from human experts in the fields in which the problem arises. Such expert systems have already come in use.

*3. Read the text again and complete these statements using information given above.*

1. Pascal and Leibnitz developed­­­­\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.
2. The analytical engine was \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.
3. First-generations machines were \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.
4. Second-generation machines used \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.
5. Third-generation machines used \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.
6. Fourth-generation computing relies on the use of \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.

*4. In pairs discuss:*

1) the advantages and the drawbacks of the first-generation computers;

2) the advantages and the drawbacks of the modern computers;

3) the development trends of the fifth-generation computers.

*5. Look at the text once more and match the words 1-7 with the words a-g to make technical terms and translate them into Ukrainian.*

1) punched

2) difference

3) hardware

4) vacuum

5) data

a) technology

b) time

c) engine

d) circuit

e) cards

6) integrated f) tube

7) processing g)input

*GRAMMAR: PRESENT SIMPLE vs. PRESENT CONTINUOUS*

*Present simple* is used when we talk about things or actions in general. We use it to say that actions happen repeatedly or that something is true in general.

*(e.g. A computer* ***consists*** *of two main parts. I* ***use*** *my computer every day.)*

We use ***do, does*** to make interrogative or negative forms.

*(e.g. He* ***doesn’t write*** *programs in C. What type of pointing devices* ***do*** *they* ***refer*** *to?)*

We use *present continuous* to speak about temporary actions happening at the time of speaking, around the time of speaking or when we talk about a period around the present.

*(e.g. He* ***is doing*** *his homework at the moment. They* ***are taking*** *their exam today.)*

There are also some verbs which are not used in *continuous tenses*: *believe, belong, forget, hate, hear, like, love, know, need, prefer, realize, see, seem, suppose, want, understand.*

*6. Complete the sentences with the present simple or present continuous form of the verbs.*

1. The difference engine (to be) a mechanical device that (carry) out a sequence of computations specified by the setting of levers, gears and cams.

2. No, computer devices (begin) to change very rapidly.

3. We are now (witness) the development of fifth-generation systems.

4. Techniques of artificial intelligence (simulate) some aspects of human thought.

5. What languages expert systems (communicate) with users and programmers?

6. We (expect) to make extensive use of the artificial intelligence techniques in the nearest future.

7. What the fourth-generation computes (rely) on?

8. We (live) in the digital age now.

9. What a computer (allow) you to do?

*WRITING*

*Write an essay about the pros and cons of using a computer or other computerized devices in your everyday life.*

**1.2. INPUT DEVICES**

*SPEAKING AND VOCABULARY: INPUT DEVICES*

*1. Continue the following sentences (1 – 5), choosing their correct endings (a – e).*

1. An input device converts incoming data and instructions into a pattern of electrical signals in binary code

2. They also include sensors that provide information about

3. Keyboardsare still the most widely used devices

4. Pressing buttons on the mouse activates

5. Touch screens are devices that allow you to use a computer by

a) their environment such as temperature and pressure.

b) for entering data and text into computer system.

c) that are comprehensible to a digital computer.

d) various activities represented by the icon selected.

e) touching the surface of its video display screen.

*2. Read the text and answer these questions:*

1. What do computer peripherals refer to?

2. What is optical laser scanner used for?

3. What are the most widely used devices for entering data and text into a computer system?

4. What are the alternatives to a touch pad?

5. How do touch screens work?

6.What devices make up the peripheral equipment of modern digital computer systems?

**INPUT DEVICES**

Input/output devices*,* also known as *computer peripherals,* any of various devices (including sensors) used to enter information and instructions into a computer for storage or processing and to deliver the processed data to a human operator or, in some cases, a machine controlled by the computer. Such devices make up the peripheral equipment of modern digital computer systems.

An input device converts incoming data and instructions into a pattern of electrical signals in binary code that are comprehensible to a digital computer. An output device reverses the process, translating the digitized signals into a form intelligible to the user.

*Input devices* include typewriter-like keyboards; handheld devices such as the mouse, trackball, joystick, and special pen with pressure-sensitive pad; and microphones. They also include sensors that provide information about their environment such as temperature and pressure. Another direct-entry mechanism is the optical laser scanner (e.g., scanners used with point-of-sale terminals in retail stores) that can read bar-coded data or optical character fonts.

*Keyboards* are still the most widely used devices for entering data and text into computer system. A computer keyboard has keys for all the characters as well as mathematical and foreign-language symbols.

*The electronic mouse* is the most popular pointing device used to move the cursor on the screen, as well as to issue commands and make icon and menu selections. By moving the mouse on a desktop or pad, you can move the cursor into an icon displayed on the screen. Pressing buttons on the mouse activates various activities represented by the icon selected.

*Touch pad* is a small rectangular touch-sensitive surface usually placed bellow the keyboard. The cursor moves in the direction your finger moves on the pad.

*Touch screens* are devices that allow you to use a computer by touching the surface of its video display screen. Some touch screens emit a grid of infrared beams, sound waves, or a slight electric current that is broken when the screen is touched. The computer senses the point in the grid where the break occurs and responds with an appropriate action. For example, you can indicate your selection on a menu display by just touching the screen next to that menu item.

*3. Read the text again and continue the following sentences.*

1. Input/output devices areused to \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.

2. An input device converts incoming data and instructions into \_\_\_\_\_\_\_\_\_\_\_.

3. Input devices include \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.

4. A computer keyboard has \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.

5. By moving the mouse on a desktop or pad, you can \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.

6. Touch pad is\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.

7. Some touch screens emit\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.

8. You can indicate your selection on a menu display by\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.

*4. In pairs discuss:*

1) modern computers peripherals;

2) varieties of output devices;

3) future of input devices.

*5. Match the words 1-7 with the words a-g to make technical terms and translate them into Ukrainian.*

1) computer

2) processed

3) binary

4) hand-held

5) touch

6) digitized

a) devices

b) current

c) peripherals

d) signals

e) code

f) data

7) electric g) screen

*GRAMMAR: INSTRUCTIONS AND ADVICE*

When we are giving the instructions, we use imperatives: to give advice or to express our ideas (good or bad), we use *should or shouldn’t + infinitive* or phrases like *it’s a good idea* or *it’s a bad idea to + infinitive.*

When we criticize or regret our mistakes in the past, we use *should/shouldn’t/ought/ought not* *+ have+past participle* *(e.g. We* ***should******have performed*** *this check-up).*

When recommending or proposing some ideas, we use *suggest, recommend, propose + that or + -ing* ( *e.g. We* ***propose applying*** *of this technique. We* ***suggest that*** *this method should be developed)*.

6. *Complete these sentences with* should *or* shouldn’t*:*

1. If you work a lot at your computer every day, you \_\_\_\_\_\_\_\_buy ergonomic furniture.

2. You \_\_\_\_\_\_\_ place your mouse not too far to support your forearm.

3. You \_\_\_\_\_\_\_\_ touch any of the computer components without need.

4. You \_\_\_\_\_\_\_\_always have a copyholder if you work with documents.

5. You \_\_\_\_\_\_\_\_ put your old monitor or video system into the bin.

6. You \_\_\_\_\_\_\_\_\_ place your monitor at eye level or below.

*7. Rewrite the sentences using the given words:*

1. Reboot your PC to see іf the problem occurs. *(should)*

2. Use your own PC’s on-board diagnostic and repaіr tools. *(recommend)*

3. Record the details of the problem so you can describe іt accurately. *(good idea)*

4. Note your system’s model name and serіal number. *(advise)*

5. Keep a reсord of hardware and software you’ve installed along with any changes you’ve made to settіngs. *(strongly recommend)*

6. Figure out how to solve the problem. *(should.)*

7. Vіsit the vendor’s website and check the FAQs. *(best thing)*

8. Avoіd phoning up after 10 p.m*. (never)*

9. Install the latest version of antivirus software. *(good idea)*

*8. Complete the text using various forms of instructions and advice:*

The planning committee made a number of proposals \_\_\_\_(deal with) the difficulties of ІT companies during the economic downturn. First, they proposed \_\_\_\_\_\_(carry out) a large –scale survey of the needs of the industry in the region. The second proposal was\_\_\_\_\_\_\_(set up) a special bank to give cheap loans to struggling engineers. The third proposal was \_\_\_\_\_ (hold) a regional conference of all small and medіum-sized ІТ companies to discuss the іssues. Fourthly, one of the major ІТ companies proposed \_\_\_\_\_\_\_\_(ask government) to help out with subsіdies and loans where necessary. To speed thіngs up, this company suggested \_\_\_\_\_\_\_\_(commіttee circulate) a draft letter for everyone to sign. They also recommended \_\_\_\_\_\_\_\_(contact) loсal government offіcials to see іf they could help.

*WRITING*

*Describe structural components and functions of a modern computer system. Give your predictions about the possible trends in development in the nearest future.*

**1.3. OUTPUT DEVICES**

*SPEAKING AND VOCABULARY: OUTPUT DEVICES*

*1. Continue the following sentences (1 – 5), choosing their correct endings (a – e).*

1. A cathode ray tube is a vacuum tube containing

2. Optical effect can be possible by polarizing the light in

3. Passive matrix has a slow response time and

4. The two types of LCD technology available are the active matrix of TFT and

5. LED monitors are flat panel, or slightly curved displays which make use of

a) is slowly becoming outdated.

b) light-emitting diodes for back-lighting, instead of cold cathode fluorescent back-lighting used in LCDs.

c) an electron gun at one end and a fluorescent screen at another end.

d) a passive matrix technology.

e) varied amounts and making it pass through the liquid crystal layer.

*2. Read the text and answer these questions:*

1. What does output equipment include?

2. What devices enable the transmission and reception of data between computers?

3. Where was CRT technology used most commonly?

4. What is the function of a cathode ray tube?

5. What way is optical effect made possible?

6. What are the advantages of LED monitors?

**OUTPUT DEVICES**

Output equipment includes video display terminal (either cathode-ray tubes or liquid crystal displays), ink-jet and laser printers, loudspeakers, and devices such as flow valves that control machinery, often in response to computer processing of sensor input data. Some devices, such as video display terminals, may provide both input and output. Other examples are devices that enable the transmission and reception of data between computers e.g. modems and network interfaces. Most auxiliary storage devices, for example, magnetic tape, magnetic disk drives, and certain types of optical compact discs also double as input/output devices.

# Types of computer monitors. *CRT (cathode ray tube) monitors.*

These monitors employ CRT technology, which was used most commonly in the manufacturing of television screens. With these monitors, a stream of intense high energy electrons is used to form images on a fluorescent screen. A cathode ray tube is basically a vacuum tube containing an electron gun at one end and a fluorescent screen at another end.

### *LCD (liquid crystal display) monitors*

The LCD monitor incorporates one of the most advanced technologies available today. Typically, it consists of a layer of color or monochrome pixels arranged schematically between a couple of transparent electrodes and two polarizing filters. Optical effect is made possible by polarizing the light in varied amounts and making it pass through the liquid crystal layer. The two types of LCD technology available are the active matrix of TFT and a passive matrix technology. TFT generates better picture quality and is more secure and reliable. Passive matrix, on the other hand, has a slow response time and is slowly becoming outdated.

The advantages of LCD monitors include their compact size which makes them lightweight. They also don’t consume much electricity as CRT monitors, and can be run off of batteries which makes them ideal for laptops.

Images transmitted by these monitors don’t get geometrically distorted and have little flicker. However, this type of monitor does have disadvantages, such as its relatively high price, an image quality which is not constant when viewed from different angles, and a monitor resolution that is not always constant, meaning any alterations can result in reduced performance.

### *LED (light-emitting diodes) monitors*

LED monitors are the latest types of monitors on the market today. These are flat panel, or slightly curved displays which make use of light-emitting diodes for back-lighting, instead of cold cathode fluorescent (CCFL) back-lighting used in LCDs. LED monitors are said to use much less power than CRT and LCD and are considered far more environmentally friendly.

The advantages of LED monitors are that they produce images with higher contrast, have less negative environmental impact when disposed, are more durable than CRT or LCD monitors, and feature a very thin design. They also don’t produce much heat while running. The only downside is that they can be more expensive, especially for the high-end monitors like the new curved displays that are being released.

*3. Read the text again and find the following.*

1) either cathode-ray tubes or liquid crystal displays;

2) devices, providing both input and output;

3) a vacuum tube containing an electron gun at one end and a fluorescent screen at another end;

4) two types of LCD technology available;

5) flat panel, or slightly curved displays which make use of light-emitting diodes for back-lighting;

6) they are more durable than CRT or LCD monitors.

*4. In pairs discuss:*

1) which of the monitors are better: LED or LCD;

2) CRT technology and its drawbacks;

3) what type of monitors is the most commonly used now and why?

*5. Match the words 1-7 with the words a-g to make technical terms and translate them into Ukrainian*

1) monochrome a) resolution

2) magnetic b) technology

3) monitor c) crystal

4) transparent d) pixels

5) light-emitting e) electrodes

6) liquid f) diodes

7) matrix g) tape

*6. Read the text and answer these questions:*

1. How are printers connected to a computer?

2. What does the quality of printers depend on?

3. What are the examples of impact printers?

4. How do **daisy wheel printers work?**

**5. What parts are inkjet** printers made of?

**6. What does a laser printer use instead of ink?**

**TYPES OF PRINTERS**

A *printer*is an electromechanical device which converts the text and graphical documents from electronic form into the physical form. Generally they are the external peripheral devices which are connected with the computers or laptops through a cable or wirelessly to receive input data and print them on the papers. A wide range of printers are available with a variety of features ranging from printing black and white text documents to high quality colored graphic images.

Quality of printers is identified by its features like color quality, speed of printing, resolution etc. Modern printers come with multipurpose functions i.e. they are combination of printer, scanner, photocopier, fax, etc. To serve different needs there is a variety of printers available that work on different types of technologies.

The history of printers dates back to 1938, when Chester Carlson developed a dry printing process called electrophotography. Later in 1949 Haloid Company of New York used this process which was then called xerography. The Haloid Company changed its name as Xerox Corporation.

  In 1976, IBM introduced the first inkjet printer which set the new standards for print quality. After two years Canon launched their printer with the “Bubble Jet” concept. Hewlett-Packard released the popular LaserJet 4 having a resolution of 600 x 600 dpi in 1992.

Since the invention of the printing technology, a variety of technologies have been employed in computer printers. Printers are categorized as impact and non-impact printers. Impact printers are the type of printers in which a key strikes the paper to make a letter. The examples of Impact printers are *Daisy wheel* and *Dot matrix printers*. Non-impact printers do not operate by striking a head against a ribbon. *Inkjet printers* and *laser printers* are the non-impact printers.

By 1980 daisy wheel printers were the dominant printers for quality printing. **Working of daisy wheel printers** is very similar to typewriters. A circular printing element known as daisy wheel is the heart of these printers. Daisy wheel printers print only characters and symbols and cannot print graphics. They are generally slow with a printing speed of about 10 to 75 characters per second

Dot Matrix Printers are popular computer printers that print text and graphics on the paper by using tiny dots to form the desired shapes. They use an array of metal pins known as printhead to strike an inked printer ribbon and produce dots on the paper. These combinations of dots form the desired shape on the paper. Generally they print with a speed of 50 to 500 characters per second. The quality of printing is determined by the number of pins used (varying from 9 to 24).

Inkjet printers are the most popular printers for home and small scale offices as they have a reasonable cost and a good quality of printing as well. A typical inkjet printer can print with a resolution of more than 300 dpi and some good quality inkjet printers are able to produce full colored hard copies at 600 dpi.

An inkjet printer is made of the printhead – the heart of the printer which holds a series of nozzles which sprays the ink drops over the paper and ink cartridge –the part that contains the ink for printing. Generally monochrome (black & white) printers contain a black colored ink cartridges and a color printer contains two cartridges – one with black ink and the other with primary colors (cyan, magenta and yellow).

Laser printers are the most popular printers that are mainly used for large scale qualitative printing. They are among the most popularly used fastest printers available in the market. A laser printer does not use ink like inkjet printers, instead it uses a very fine powder known as toner. The control circuitry is the part of the printer that talks with the computer and receives the printing data. A Raster Image Processor (RIP) converts the text and images into a virtual matrix of dots. The photoconducting drum which is the key component of the laser printer has a special coating which receives the positive and negative charge from a charging roller. A rapidly switching laser beam scans the charged drum line by line. When the beam flashes on, it reverses the charge of tiny spots on the drum, respecting to the dots that are to be printed black. As soon the laser scans a line, a stepper motor moves the drum in order to scan the next line by the laser.

*7. Continue the following sentences (1 – 8), choosing their correct endings (a – h).*

1. A printeris an electromechanical device which

2. Quality of printers is identified by its features like

3. The history of printers dates back to 1938, when

4. In 1976, IBM introduced the first inkjet printer which

5. Since the invention of the printing technology, a variety of

6. Printers are categorized as

7. Dot Matrix Printers are popular computer printers that

8. Inkjet printers are most popular printers for home and small scale offices as they have

a) Chester Carlson developed a dry printing process called electrophotography.

b) set the new standards for print quality.

c) converts the text and graphical documents from electronic form to the physical form.

d)color quality, speed of printing, resolution etc.

e) technologies have been employed in computer printers.

f) a reasonable cost and a good quality of printing.

g) print text and graphics on the paper by using tiny dots to form the desired shapes.

h) impact and non-impact printers.

*8. Complete the following sentences:*

1. Quality of printers is identified by\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.
2. Daisy wheel printers are \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.
3. Inkjet printers are \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.
4. Laser printers are mainly used for \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.
5. A laser printer does not use ink like inkjet printers, instead it uses \_\_\_\_\_\_\_.
6. A Raster Image Processor (RIP) converts \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.

*9. In pairs discuss:*

1) the most common ways of receiving information;

2) advantages of modern printers;

3) reasons of changes in printing technologies.

*GRAMMAR: COUNTABLE AND UNCOUNTABLE NOUNS*

Before singular countable nouns you can use ***a/an***.

We use ***many, few, a few*** with countable nouns *(e.g. a few files, many icons).*

Before uncountable nouns you can say ***the, some, any, much, a lot of, little, a little*** *(e.g. a lot of damage, some software, etc.).* Some nouns are uncountable in English, but countable in other languages: *e.g. advice, equipment, news, permission, research, work*.

*10. Decide if these nouns are countable, uncountable or either depending on the context. Write* C, U *or* C and U

1. User\_\_\_\_\_\_\_\_
2. Software\_\_\_\_\_\_\_\_\_\_\_\_\_\_
3. Email\_\_\_\_\_\_\_\_\_\_
4. Multimedia\_\_\_\_\_\_\_\_\_\_\_\_\_
5. Computing\_\_\_\_\_\_\_\_\_
6. Advice\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
7. Edition\_\_\_\_\_\_\_\_\_\_
8. Entertainment\_\_\_\_\_\_\_\_\_\_\_
9. Robotics\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
10. Storage\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
11. Interface\_\_\_\_\_\_\_\_\_\_\_
12. Icon\_\_\_\_\_\_\_\_\_\_\_
13. Equipment
14. Technology\_\_\_\_\_\_\_\_\_\_
15. News\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
16. Security\_\_\_\_\_\_\_\_\_\_\_\_
17. Research
18. Spyware\_\_\_\_\_\_\_\_\_\_
19. Homework\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

*WRITING*

*Write an e-mail to your friend who has asked you to help him/her in choosing a display device which he/she needs to prepare multimedia presentations. Give your recommendations.*

**1.4. NEW TRENDS IN INPUT/OUTPUT TECHNOLOGY**

*SPEAKING AND VOCABULARY: INPUT/OUTPUT TECHNOLOGY*

*1. Continue the following sentences (1 – 5), choosing their correct endings (a – e).*

1. Until the last decade, keyboards, mice and remote controls were

2. Today manufacturers are designing remote controls that

3. The basic computer mouse has remained essentially unchanged since

4. Smart pens equipped with tiny processors that wirelessly record and transmit notes and audio

5. Shopping malls are introducing large-scale interactive displays that sense

a) incorporate touch sensor technology into display screens.

b) are staking a claim at the expense of the analog pen and pad.

c) the go-to intermediaries with our devices.

d) when shoppers are nearby and can offer directions and other assistance.

e) its development in the 1970s.

*2. Read the text and answer these questions:*

1. How long has the QWERTY keyboard been used for human-machine interaction?

2. What kind of displays are shopping malls introducing?

3. Why gesture technology is popular among children?

4. What are automotive manufacturers introducing into new vehicles?

5. Can smart phones now be used as a supplement to more traditional remote controls?

6. Are any devices being developed now to control our mind*?*

**INPUT/OUTPUT TECHNOLOGY**

The QWERTY keyboard, which dates back to early typewriter designs, has been central to human-machine interaction for more than 130 years. Likewise, the basic computer mouse has remained essentially unchanged since its development in the 1970s, and wireless television remote controls have been around for nearly 60 years. But as computers and gadgets have become more portable, developers have looked for ways to update and streamline our interaction protocol, designing devices that are more intuitive than ever before. The spectrum of alternative input applications across the CE (Computer Electronics) industry is broad. Today manufacturers are designing remote controls that incorporate touch sensor technology into display screens, enabling users to control everything in their homes from entertainment, to security. At the same time, game developers are perfecting touch-less technology, introducing gesture-controlled game consoles as well as mobile games that respond to motion sensors without the aid of a camera. In offices and classrooms, smart pens equipped with tiny processors that wirelessly record and transmit notes and audio are staking a claim at the expense of the analog pen and pad. Car manufacturers are teaming up with speech recognition firms to design and incorporate more sophisticated voice control software into auto interiors, enabling drivers to control gadgets while keeping their eyes on the road. Will these alternative input methods ultimately eliminate the need for more traditional input methods like the mouse and keyboard? Why are some technologies reaching full stride in the market while others appear to be forever relegated to movies screens and science fiction novels? The answers may have something to do with balancing ease of use with consumer discomfort concerning more invasive technologies.

*Touch and Go: Next-Generation Touchscreens*. In 2011, touchscreen technology is perhaps the most widely adopted and integrated alterative input method on the market. Recognizing that touch isn’t the most effective tool for interaction with all devices, researchers at Microsoft’s Applied Sciences Group are developing the next-generation of computer input technologies, focusing specifically on the integration of touch and Overall Income. Interactive motion sensing touchscreens for use in public spaces are already on display. Shopping malls are introducing large-scale interactive displays that sense when shoppers are nearby and can offer directions and other assistance. Meanwhile in digital conference rooms, touchscreens transform white boards into interactive screens with built-in cameras. As 3D screens gain market share we may see a great amalgamation between touch and motion sensing technology.

*Game Time: Touch and Motion Sensors in Video Game Controls*. Motion sensing technology has its roots in the gaming industry. The introduction of the Nintendo Wii, in 2006, prompted players to ditch the remote for a wireless wand with a built-in accelerometer and infrared light that allowed them to control avatars and games in multiple dimensions. Perhaps unsurprisingly, given its broad appeal in the at-home gaming market, gesture technology is on the rise in households with children.

*Talk to Me: Speech and Handwriting Recognition Take Off*. The car has become a hotspot for speech recognition software, since drivers need to keep their hands and eyes focused on the road. Automotive manufacturers are compensating for background noise in cars by introducing multiple interior microphones into new vehicles. These microphones feed into software programs and create a beam of sound that can listen selectively in certain directions.

*Home Automation Goes Mobile*. It’s time to ditch that old clicker collecting dust on the coffee table. The latest remote control systems can command every room in the home – monitoring lights and HVAC systems, arming and disarming security systems, and operating music and home entertainment theaters. Even the remote itself has gone mobile. Smart phones can now be used as a supplement to more traditional remote controls.

*Mental Control: Headed our Way?* Several tech firms have announced that they are developing devices that incorporate brain-computer interface (BCI) technology.

For now, consumers who are uncomfortable with seismic changes in their digital world can take comfort – the keyboard and its companion mouse will stay with us for the time being, although their functionality and capabilities are sure to change over time as researchers redefine how we can communicate with our devices more seamlessly.

*3. Read the text again and continue the following sentences.*

1. As computers and gadgets have become more portable, developers \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.

2. Today manufacturers are designing remote controls that \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.

3. In digital conference rooms, touchscreens transform white boards into\_\_\_\_\_\_\_.

4. Motion sensing technology has its roots in\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.

5. Gesture technology is on the rise in \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.

6. Smart phones can now be used as a supplement to \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.

*4. In pairs discuss:*

1) why has the basic computer mouse remained unchanged since 1970s;

2) what can be controlled remotely in the future;

3) what are the disadvantages of new technologies if there are any.

*5. Match the words 1-7 with the words a-g to make technical terms and translate them into Ukrainian*

1) interior a) console

2) remote b) applications

3) infrared c) controlled

4) motion d) microphones

5) interactive e) recognition

6) game f) light

7) speech g) sensors

*GRAMMAR: PRESENT PERFECT VS PAST SIMPLE*

*Present perfect* is used to describe completed actions in present. It is used to give new information about a recent happening. We form present perfect using *have/has+ past participle (e.g. I* ***have*** *just* ***finished*** *my job).*

Present perfect is often used with the words *already, yet, just, ever, never, since. Past simple* is used to describe actions in the past, which happened one after the other, past habits or actions with a stated time reference. It is often used with such words as: *last (last year, week, month), ago (three days ago, a week ago) yesterday, the day before yesterday etc*. In past simple interrogative and negative forms we form using *did/didn’t* (*e.g. When* ***did*** *you* ***do*** *this job. We* ***didn’t send*** *him any message*).

*6. Complete these sentences with one of the words in brackets:*

1. In the first-generation machines magnetic tape (was/ has been) the predominant I/O medium.

2. How many books (have you read/ read since January?

3. After graduation I (have worked/ worked) for a year for software company.

4. I (sent/ have sent) my CV last Monday. Have you received/ did you receive it yet?

5. Second-generation machines (used/ have used) random access core memories.

6. (Did you work/ have you ever worked) as a system administrator?

*WRITING*

*Write a report comparing different kinds of input devices (e.g. a mouse and a stylus). Use the material of 1.2*

**1.5. CENTRAL PROCESSING UNIT**

*SPEAKING AND VOCABULARY:**CENTRAL PROCESSING UNIT*

*1. Continue the following sentences (1 – 8), choosing their correct endings (a – i).*

1. The circuitry of a CPU can be subdivided into

2. Logical operations can be used to compute

3. While performing these operations the ALU takes data from

4.The control unit is the most

5. The power and performance of a computer is determined by

6. Multicore processor can be simply described as

7. Modern processors offer

8. Because the cores don’t work with a fixed frequency, it is difficult

a) whether a particular statement is true or false.

b) complex block of computer hardware from a designer’s point of view.

c) two major subunits: the arithmetic-logic unit and the control unit.

d) new multicore architectures.

e) the temporary storage area inside the CPU named *registers*.

f) many interconnected processors in a single package.

g) to predict the performance for a sequence of instructions.

h) the speed of its processor.

i) dynamic frequencies for each of their cores.

*2. Read the text and answer these questions:*

1. What is the most important hardware component of a computer system?

2. What are the main units of a CPU?

3. What operations does the arithmetic-logic unit perform?

4. Where does the ALU take data from?

5. What is the power and performance of a computer determined by?

6. How can a multicore processor be described?

**CPU**

The central processing unit (CPU) is the most important hardware component of a computer system. The circuitry of a CPU can be subdivided into two major subunits: *the arithmetic-logic unit* and *the control unit*. The CPU also includes circuitry for devices such as *registers* and *cache memory* for high-speed, temporary storage of instructions and data elements.

*The* *arithmetic-logic unit* (ALU)is the hardware which performs arithmetical operations, comparisons, logical (Boolean) operations, and shifting operations. Comparison operations allow a program to make decisions based on its input data and the results of previous calculations. Logical operations can be used to compute whether a particular statement is true or false. Logical operations are also frequently used for manipulating particular bits within a byte or word. The logical and shifting operations are used together to edit bit patterns – to extract a group of bits from one pattern and insert it at a given position within another bit pattern.

While performing these operations the ALU takes data from the temporary storage area inside the CPU named *registers*.

Registers are a group of cells used for memory addressing, data manipulation and processing. Registers are the fastest storage units available on the chip. There are several types of registers: Current Instruction Register (CIR) – a register that holds the instruction that is currently executed; Program Counter (PC) – a register that holds the address of the next instruction that will be executed; Memory Data Register (MDR) – register that holds data that has been read in from main memory or produced by the CPU and waiting to be stored in main memory; Memory Address Register (MAR) – register that holds the address of the memory location in main memory (RAM) where input/output data is supposed to be read in/written out; Accumulator (AC) – a register that typically resides inside the ALU.

*The control unit* is the most complex block of computer hardware from a designer’s point of view. Its function is to generate control signals needed by the other blocks of the machine in a predetermined sequence to bring about the sequence of actions called for by each instruction.

The power and performance of a computer is determined by the speed of its processor. The speed at which a computer can carry out its operations is referred to as its gigahertz (GHz) rate.

Most machines today have at least a dual-core processor. However, quad–coreand octal-core processors, with four and eight cores, respectively, are quite popular on servers, advanced workstations, and even on high-end mobile computers. Modern processors offer new multicore architectures. The different kinds of applications generated with C# 2010 and .NET Framework 4 run on one or many CPUs. Each of these processors can have a different number of cores, capable of executing multiple instructions at the same time.

Multicore processor can be simply described as many interconnected processors in a single package. All the cores have access to the main memory. Thus, this architecture is known as shared–memorymulticore. Sharing memory in this way can easily lead to a performance bottleneck.

Multicore processors have many different complex architectures, designed to offer more parallel-execution capabilities, improve overall throughput, and reduce potential bottlenecks. At the same time, multicore processors try to reduce power consumption and generate less heat. Therefore, many modern processors can increase or reduce the frequency for each core according to their workload, and they can even sleep cores when they are not in use. The average *clock frequency* for all the cores under heavy workloads is going to be lower than the one achieved for the single core.

*3. Read the text again and find the following.*

1) the most important hardware component of a computer system;

2) a group of cells used for memory addressing, data manipulation and processing;

3) a register that holds the instruction that is currently executed;

4) a register that holds the address of the next instruction that will be executed;

5) a register that holds data that has been read in from main memory;

6) many interconnected processors in a single package.

*4. In pairs discuss:*

1) functions of the arithmetic-logic unit and the control unit;

2) types of registers and their functions;

3) the capabilities of modern processors.

*5. Match the words 1-8 with the words a-h to make technical terms and translate them into Ukrainian*

1) storage a) operation

2) arithmetic-logic b) instructions

3) multiple c) memory

4) multicore d) consumption

5) power e) processors

6) cache f) counter

7) shifting g) area

8) program h)unit

*GRAMMAR: COMPARATIVES*

We form the comparative of one-syllable adjectives by adding –er *(e.g. young/younger, old/older*). We use *–er* with two-syllable adjectives, ending in –y. They change *-y* into *–i* before the endings *–er.*  (e.g. easy/easier, noisy/noisier etc.).

Two- and more syllable words usually take *more/less* (*e.g. expensive/more expensive, convenient/more convenient*).

We use *–est* to form superlatives of shorter adjectives (*e.g. long/longest, old/oldest*). We use *most* for longer adjectives (*e.g. most expensive, most difficult*).

Irregular forms: good –better –the best

bad –worse – the worst

little – less – the least

Equality is expressed by using *as…as*. Difference can be shown by using not so…as, than (*e.g. This system is* ***as complicated as*** *that one. Your computer is not as expensive as mine. This program is* ***more difficult than*** *the previous one*).

*6. Complete these sentences using the comparative degree of the adjectives in brackets.*

1. Transistors consumed (little) energy and were (fast) and (reliable) than vacuum tubes.

2. Multi-function printers are (expensive)\_\_\_\_\_\_\_\_\_ than usual printers.

Registers are (fast) storage units than many other available today.

3. This platesetter is (reliable)\_\_\_\_\_\_\_\_\_and (easy)\_\_\_\_\_\_\_\_\_ to use than most of the printers.

4. Your prіnter is as (good)\_\_\_\_\_\_\_\_ as the paper you use.

5. The final result is usually (accurate) \_\_\_\_\_\_\_\_\_than the original image.

6. An imagesetter is (heavy) \_\_\_\_\_\_\_\_\_ than a laser printer.

*WRITING*

*A friend of yours sent you an e-mail explaining that she/he had lost all information on her/his computer because of a serious malfunction. Write a reply, giving her/him an advice about measures which should be taken.*

**1.6. TYPES OF MEMORY**

*SPEAKING AND VOCABULARY:**TYPES OF MEMORY*

*1. Continue the following sentences (1 – 8), choosing their correct endings (a – h).* 1. Main memory is called random access memory (RAM) because you

2. An important characteristic of RAM in general is that

3. The main memory in a system is a collection of chips or modules containing

4.Read-only memory, or ROM, is a type of memory that

5.Flash is nonvolatile memory, enabling users to easily

6. The memory cells in a DRAM chip are tiny

7. PC designers have found a way to use SRAM

8. During read operations, the data in the high-speed cache memory is resupplied

a) from the lower-speed main memory or DRAM in advance.

b) to dramatically improve PC performance.

c) can permanently or semi-permanently store data.

d) randomly (as opposed to sequentially) access any location in memory.

e) chips that are usually plugged into the motherboard.

f) data is stored as long as the memory has electrical power.

g) update the ROM or firmware in their motherboards or any other components (video cards, SCSI cards, peripherals, and so on).

h) capacitors that retain a charge to indicate a bit.

*2. Read the text and answer these questions:*

1. What does a computer memory subsystem consist of?

2. How does RAM maintain data?

3. What are the main advantages of DRAM chips?

4. What type of RAM doesn’t require the periodic refreshing?

5. What is an important characteristic of RAM?

6. What types of memory are found in a typical PC?

**COMPUTER MEMORY**

The *memory* subsystem of a computer is functionally a set of registers where data and programs are stored. The instructions from the programs stored in memory are retrieved by the control unit of a computer and are decoded to perform the appropriate operation on the data stored either in memory or in a set of registers in the CPU.

*Main memory* is called *random access memory* (RAM) because you can randomly (as opposed to sequentially) access any location in memory. It maintains data without power and can’t normally be written to. Although a hard disk can be used as virtual random access memory, we don’t consider that RAM either. Over the years, the definition of RAM has changed from a simple acronym to become something that means the primary memory workspace the processor uses to run programs, which usually is constructed of a type of chip called dynamic RAM (DRAM). One of the characteristics of DRAM chips (and therefore most types of RAM in general) is that they store data dynamically, which really has two meanings. One meaning is that the information can be written to RAM repeatedly at any time. The other has to do with the fact that DRAM requires the data to be refreshed (essentially rewritten) every few milliseconds or so; faster RAM requires refreshing more often than slower RAM. A type of RAM called static RAM (SRAM) does not require the periodic refreshing. An important characteristic of RAM in general is that data is stored only as long as the memory has electrical power.

RAM chips are sometimes termed *volatile storage* because when you turn off your computer or an electrical outage occurs, whatever is stored in RAM is lost unless you saved it to your hard drive. Physically, the main memory in a system is a collection of chips or modules containing chips that are usually plugged into the motherboard. New types and speeds of memory are being adopted more quickly than before, and any new systems you purchase now most likely will not accept the same memory as your existing ones.

To better understand physical memory in a system, you should understand what types of memory are found in a typical PC and what the role of each type is. Three main types of physical memory are used in modern PCs:

ROM (Read-only memory)

DRAM (Dynamic random access memory)

SRAM (Static RAM)

*Read-only memory*, or *ROM*, is a type of memory that can permanently or semi-permanently store data. It is called read-only because it is either impossible or difficult to write to. ROM also is often referred to as *nonvolatile* memory because any data stored in ROM remains there, even if the power is turned off. As such, ROM is an ideal place to put the PC’s startup instructions, that is, the software that boots the system. Note that ROM and RAM are not opposites, as some people seem to believe. Both are simply types of memory. In fact, ROM could be classified as technically a subset of the system’s RAM. This is necessary to contain the software that enables the PC to boot up; otherwise, the processor would have no program in memory to execute when it was powered on. The main ROM BIOS is contained in a ROM chip on the motherboard, but there are also adapter cards with ROMs on them as well. ROMs on adapter cards contain auxiliary BIOS routines and drivers needed by the particular card, especially for those cards that must be active early in the boot process, such as video cards. Cards that don’t need drivers active at boot time typically don’t have a ROM because those drivers can be loaded from the hard disk later in the boot process. Most systems today use a type of ROM called electrically erasable programmable ROM (EEPROM), which is a form of *flash memory*.

*Flash* is nonvolatile memory that is rewritable, enabling users to easily update the ROM or firmware in their motherboards or any other components (video cards, SCSI cards, peripherals, and so on).

Flash memory brings convenience to information industries for storage of data. Flash memory cards are formed in card shapes in which memory chips are sealed in card type outer shells. Flash memory cards are designed in many standards such as an SD (Secure-Digital) card, a multimedia card, a Smartmedia, a compact flash (CF) card, and a memory stick. SD card is an extension of the earlier MultiMediaCard (MMC) format. SD cards are hot-swappable, allowing the user to easily insert and remove SD cards without *rebooting* or cycling power. Information equipment such as personal computers, PDAs, digital cameras, and cellular phones are generally provided with a card slot for mounting a flash memory card.

*DRAM Dynamic RAM (DRAM*) is the type of memory chip used for most of the main memory in a modern PC. The main advantages of DRAM are that it is very dense, meaning you can pack a lot of bits into a very small chip, and it is inexpensive, which makes purchasing large amounts of memory affordable. The memory cells in a DRAM chip are tiny capacitors that retain a charge to indicate a bit. The problem with DRAM is that it is dynamic, that is, its contents can be changed. With every keystroke or every mouse swipe, the contents of RAM change. And the entire contents of RAM can be wiped out by a system crash.

Another distinctly different type of memory exists that is significantly faster than most types of DRAM. SRAM stands for static RAM, which is so named because it does not need the periodic refresh rates like DRAM. Because of how SRAMs are designed, not only are refresh rates unnecessary, but SRAM is much faster than DRAM and much more capable of keeping pace with modern processors. The high number of transistors and the clustered design mean that SRAM chips are both physically larger and much more expensive to produce than DRAM chips. PC designers have found a way to use SRAM to dramatically improve PC performance. The cache runs at speeds close to or even equal to the processor and is the memory from which the processor usually directly reads from and writes to. During read operations, the data in the high-speed cache memory is resupplied from the lower-speed main memory or DRAM in advance.

*3. Read the text and complete the following sentences.*

1. Main memory is called random access memory (RAM) because\_\_\_\_\_\_\_.
2. \_\_\_\_\_\_\_\_does not require the periodic refreshing.
3. RAM chips are sometimes termed volatile storage because \_\_\_\_\_\_\_\_\_.
4. It is called read-only because \_\_\_\_\_\_\_\_\_.
5. ROM could be classified as technically a \_\_\_\_\_\_\_\_\_\_.

6. PC designers have found a way to use SRAM to \_\_\_\_\_\_\_\_\_\_\_.

*4. In pairs discuss:*

1) characteristics of volatile and non-volatile types of memory;

2) advantages of flash memory;

3) differences between flash and cache memory.

*5. Match the words 1-7 with the words a-g to make technical terms and translate them into Ukrainian*

1) a set of a) card

2) volatile b) memory

3) store c) registers

4) flash d)camera

5) multimedia e) cell

6) digital f)memory

7) memory g) data

*GRAMMAR: CONNECTORS*

Connectors are words which join our ideas and help to organize our speech when we are giving examples, reasons and cause of the actions, processes, etc. To express addition we use connectors *furthermore, besides, and, in addition, moreover*.

To make contrast we use: *although, however, whereas, but, on the other hand*.

To show the results or impact of something the following connectors are used: *so, therefore, consequently, thus, as a result, because.*

*6. Choose the correct word in brackets to complete the sentences.*

1. The memory subsystem of a computer is functionally a set of registers (so/consequently ) data and programs are stored there.

2. The instructions from the programs stored in memory are retrieved by the control unit of a computer ( and/as a result) they are decoded to perform the appropriate operation.

3. A Blu-ray disc is very expensive (but/so) you should use it carefully.

4. Blu-ray is going to replace DVD soon (because/besides) it offers greater storage capacity.

5. (Although/Consequently) a hard disk can be used as virtual random access memory, we don’t consider that RAM either.

6. DRAM requires the data to be refreshed (so/although) SRAM does not require the periodic refreshing.

*WRITING:*

*Write a report comparing two flash-based devices that you own. Describe their similarities and differences in technology and performance.*

**UNIT2. COMPUTER SOFTWARE**

**2.1. The operating system**

**2.2. Word processing**

**2.3. Databases**

**2.4. Graphics and design**

**2.5. Multimedia**

**2.1. THE OPERATING SYSTEM**

*SPEAKING AND VOCABULARY: THE OPERATING SYSTEM*

*1. Match the sentence beginnings (1 – 5) with the correct endings (a – e).*

1. System software consists of programs that

2. A mobile OS is responsible for identifying and defining mobile device features and functions, including

3. Application software is launched via the operating system

4. All software, including the operating system, is designed to

5. Icons are small pictures that are used to represent processing

a) by using the Windows Start menu.

b) communicate with you in a certain way.

c) are related to controlling the actual operations of the computer equipment.

d) keypads, application synchronization, email, thumbwheel and text messaging.

e) options such as an application or program, or documents.

*2. Read the text and answer these questions:*

1. What is the function of a computer program?

2. How many types is software divided into?

3. What are common desktop operating systems?

4. What is a mobile OS responsible for?

5. How is application software launched?

6. What do graphic user interfaces include?

**STRUCTURE AND FUNCTION OF AN OPERATING SYSTEM**

A computer is directed by a series of instructions called a computer program that tells the computer what to do. Computer programs are commonly referred to as *software.* Software can be divided into two types – *system software* and *application software*.

System software consists of programs that are related to controlling the actual operations of the computer equipment. The most important system software package for any computer is its *operating system*. An operating system is an integrated system of programs that manages the operations of the CPU, controls input/output and storage resources and activities of the computer system and provides various support services as the computer executes the application programs of users. Common desktop operating systems designed for personal computers are Windows, Mac OS and Linux.

*A mobile operating system* (mobile OS) is an OS built exclusively for a mobile device, such as a smartphone, personal digital assistant (PDA), tablet or other embedded mobile OS. Popular mobile operating systems are Android, Symbian, iOS, BlackBerry OS and Windows Mobile. A mobile OS is responsible for identifying and defining mobile device features and functions, including keypads, application synchronization, email, thumbwheel and text messaging. A mobile OS is similar to a standard OS but is relatively simple and light and primarily manages the wireless variations of local and broadband connections, mobile multimedia and various input methods.

*Application software* consists of programs designed to allow people to perform specific tasks using a computer, such as creating letters, preparing budgets, managing inventory and customer databases, playing games, watching videos, listening to music, scheduling appointments, editing digital photographs, designing homes, viewing Web pages, burning DVDs, and exchanging e-mail. Application software is launched via the operating system by using the Windows Start menu.

There are also application programs that help users write their own programs in a form the computer can understand using a programming language like BASIC, Visual Basic, COBOL, C++, Java, or Python. Some languages are traditional programming languages for developing applications; others are designed for use with Web pages or multimedia programming.

All software, including the operating system, is designed to communicate with you in a certain way. The way the software communicates with you is called the *user interface*. A user interface is the way you tell the software what to do and the way the computer displays information and processing options to you. One of the more common user interfaces is the *graphical user interface* (GUI). The graphical user interface, or GUI (pronounced gooey), combines text and graphics to make the software easier to use. Graphic user interfaces include several common features such as icons, windows, menus, and buttons.

Icons are small pictures that are used to represent processing options such as an application or program, or documents. A window is a rectangular area of the screen that is used to present information. The term Windows, with a capital W, refers to Microsoft Windows, the most popular operating system and graphical user interface for personal computers.

*3. Read the text again and find the following.*

1) integrated system of programs that manages the operations of the CPU;

2) small pictures that are used to represent processing options;

3) series of instructions that tells the computer what to do;

4) the most important system software package for any computer;

5) a rectangular area of the screen that is used to present information;

6) the way the software communicates with you.

*4. In pairs discuss:*

1) what are the most popular OSs?

2) the peculiarities of mobile operating systems in comparison with a standard OS.

3) application programs.

*5. Match the words (1 – 8) with the words (a – h) to make technical terms and translate them into Ukrainian.*

1) operating

2)system

3) broadband

4) mobile

5) storage

6) input

a) resources

b) connections

c) interface

d) system

e) multimedia

f) options

7) user g) method

8) processing h) software

*GRAMMAR: ADVERBS*

Adverbs are used to give us more information about an action. Adverbs of manner, time and place describe how, when or where something happens. We put an adverb after a verb (*e.g. He drives* ***carefully***). In a sentence we use adverbs before adjectives or before past participles (*e.g. badly organized, terribly expensive*).

Usually an adverb is formed by adding –*ly* to an adjective (*e.g quiet/quietly, slow/slowly*). The adverb from *good* is *well*.

Some words have the same form as an adjective and an adverb (*fast, hard, early, late, daily*).

*7. Complete these sentences with the adverbial form of the words in brackets.*

1. Computer programs are (common) referred to as software.

2. A mobile operating system (mobile OS) is an OS built (exclusive) for a mobile device.

3. A mobile OS is similar to a standard OS but is (relative) simple and light.

4. It (primary) manages the wireless variations of local and broadband connections.

5. The computer was (certain) adopted (quick) as a replacement for the typewriter when users had increased access to computers.

6. This is (especial) true when it comes to making changes to (previous) created documents.

*WRITING*

*Write a report comparing a standard OS of the most recent Windows version (you know today) and one of the mobile OS.*

## 2.2. WORD PROCESSING

*SPEAKING AND VOCABULARY: WORD PROCESSING*

*1. Match the sentence beginnings (1 – 8) with the correct endings (a – h).*

1. The computer was certainly adopted quickly as

2. Computers are generally sold with

3. While there are many word processors available

4. The computer will scan your document and

5. Word processors can be quite complicated and

6. Three functions of word processing assist you with

7. This small arrow or vertical line that appears on the screen allows you

8. Word processors enable the user

a) provide the user with very advanced functions.

b) what we call creating or starting a new document.

c) pick up any miss-spelled word errors or grammar issues you may have in your writing.

d) factory installed word processing software.

e) a replacement for the typewriter.

f) each and everyone has the ability to perform the basics.

g) to see where you are located in the document.

h) to create or type a document, edit, format, print and save.

*2. Read the text and answer these questions:*

1. What is the most commonword processing software?

2. What can word processing utilize to produce advanced word document presentations?

3. What do word processors enable the user?

4. What functions can word processors provide users with?

5. What is the most integral function in starting a document?

6. What are the advantages of word processing?

7. What buttons are most often used in correcting/editing?

8. How is spelling and grammar check fulfilled in word processing?

## WORD PROCESSING

Word processing is probably the most common among the "productivity" software applications in use. The computer was certainly adopted quickly as a replacement for the typewriter when users had increased access to computers and discovered its advantages in document creation, editing, formatting and saving -- that is, its word processing capabilities. This is especially true when it comes to making changes to previously created documents. It is no longer necessary to re-type entire pages and/or documents in order to add, delete and make corrections, among other things. It has become as simple as retrieving the originally typed document from the computer (or storage device), making the necessary changes and either printing it with the "push of a button" (or few keystrokes) or putting the new version back into a file on the computer or on a storage device. In fact, there should be less chance of errors and typos because of such features as spelling and grammar checking options.

Computers are generally sold with factory installed word processing software, but often this software is not the product or version desired by the customer. As a result, purchasers tend to purchase, install and upgrade to a more common and familiar word processor.

Perhaps the most common and familiar to computer users are such word processing software as Microsoft Word and WordPerfect. In fact, word processing has advanced to the point of being within a “suite” of productivity software applications and, as a result, can utilize the interconnectivity of the programs in this “suite” to produce advanced word document presentations with such features as “linked” tables, maps and websites.

For more technical documents, there's an option to utilize a feature called “Cite While You Write” which inserts commands into the menu (i.e., : “Tools”) of the word processing program (e.g., Microsoft Word) to give the user direct access to references and enables the bibliographic software (e.g., EndNote or ProCite) to conduct bibliographic formatting during the writing stage in the open document.

While there are many word processors available, each and everyone has the ability to perform the basics. That is, word processors enable the user to create or type a document, edit (make additions and corrections, as well as check spelling and grammar, move, copy and paste text), format (e.g., change spacing and capitalization, bold, italicize and underline text), print and save. Word processors can be quite complicated and provide the user with very advanced functions.

Microsoft Word 2007 attempts to change the de facto word (and office) document file format, but the Open Document is used across more word processors and is gaining in popularity faster.

Microsoft's newest update to the application is Word 2010 which was released in June of 2010. The application included a release of a free online version that works on an applet on most browsers that could be accessed through Microsoft’s online email client, Live or Hotmail. The new version also replaced what once was Microsoft Works with Office Starter 2010 offering a more basic word processor in the suite which comes pre-installed on most computers.

**Basics of “building” a Document: Creating**

When you enter text onto a new word document by a use of a keyboard you are not only inputting data into the computer but you are also forcing the computer to begin word processing in a new document.

Three functions of word processing assist you with this process of what we call creating or starting a new document. The most integral function is the cursor. This small arrow or vertical line that appears on the screen allows you to see where you are located in the document. It allows you to navigate through the document so that you do not lose your place.

On the right side of your document you will also find a scrolling device that allows you to quickly move back and forth through the document from beginning to end. This device allows you to preview the beginning and end of the document while saving a vast amount of time*.*

In order to create a document, you first open word and save the document under a relevant name. Proceed to input you data, you can include clip art, graphics, color, bold, etc. Microsoft word automatically saves your work as you go but it is always suggested that you save and save often so in the event of a hard drive crash, power failure your work is not lost.

**Correcting/Editing**

Editing is the process of making changes or modifications to an existing document. In word processors there are many features that can assist you with editing your document. Word processing allows people to spend less time with editing and formatting which in turn allows them to put more time into the piece they are writing. Instead of whiteout or erasing if we make a mistake we can use the insert & delete button. If we feel we want to make additions to the document we can use the insert button and start typing wherever we place the cursor.

Editing in word processing also allows you to cut and paste which used to be a function only with scissors and glue however you can do this on the computer also with a touch of a button. Word processing also allows you to copy a word, paragraph or picture and paste to another location or another file.

The last two elements of word processing that we have become to increasingly rely on in our daily careers, schooling and writing is spelling and grammar check. The computer will scan your document and pick up any miss-spelled word errors or grammar issues you may have in your writing. Be careful with the spell check feature as if the word is spelled correctly but in the wrong context it will not pick it up. These features are good but still need the human eye to totally understand the language.

*3. Read the text again and find the following.*

1) the most common among the “productivity” software applications;

2) word processing capabilities;

3) most common and familiar to computer users word processing software;

4)a feature which inserts commands into the menu;

5) the most integral function;

6) device that allows you to quickly move back and forth through the document.

*4. In pairs discuss:*

1) advantages of word processing;

2) functionality of the different kinds of word processing software;

3) specialized word processing options.

*5. Match the words (1 – 8) with the words (a – h) to make technical terms and translate them into Ukrainian.*

1) word a) software

2) software b) processing

3) checking c) failure

4) scrolling d) applications

5) installed e) button

6) direct f) options

7) power g) access

8) delete h) device

*GRAMMAR: EXPRESSING THE USE OR FUNCTION OF A DEVICE*

The use and function of a device can be described in a number of ways:

1) to+infinitive: *a button to delete information*;

2) (used) for+-ing: *devices for storing data*;

3) that/which + present simple: *programs that produce advanced word document presentations*

4) function/act as: *memory chips act as a buffer between the processor and main memory*

*6. Write the items 1-6 in different ways using other language forms to have the same meaning:*

1) word processors that enable the user to create or type a document;

2) Microsoft Works with Office Starter 2010 offering a more basic word processor in the suite;

3) functions of word processing that assist you with creation of a new document;

4) a stream of intense high еnergy electrons that is used to form images;

5) a vacuum tube containіng an electron gun at one еnd and a fluorescеnt screen at another end;

6) a scrolling device that allows you to quickly move back and forth through the document from beginning to end;

7) an option to utilize a feature called “Cite While You Write”;

8) the word processing program to give the user direct access to references and enables the bibliographic software.

*WRITING*

*You friend has just begun to study word processing programs. He needs to insert a photo into his resume. Write instructions, explaining to him how to perform this task.*

## 2.3. DATABASES

*SPEAKING AND VOCABULARY: DATABASES*

*1. Match the sentence beginnings (1 – 8) with the correct endings (a – h).*

1. Databases are structured to facilitate

2. A database is stored as a file or a set of files on

3. Using keywords and various sorting commands, users can rapidly

4. The power of a DBMS comes from its ability to define new relationships from

5. In flat databases, records are organized according to

6. The records in hierarchical databases are organized in a treelike structure

7. The largest databases are usually maintained

8. Increasingly, formerly separate databases are being combined

a) magnetic disk or tape, optical disk, or some other secondary storage device.

b) search, rearrange, group, and select the fields in many records to retrieve or create reports on particular aggregates of data.

c) the storage, retrieval, modification and deletion of data.

d) by governmental agencies, business organizations, and universities.

e) with each level of records, branching off into a set of smaller categories.

f) a simple list of entities.

g) the basic ones given by the tables and to use them to get responses to queries.

h) electronically into larger collections known as data warehouses.

*2. Read the text and answer these questions:*

1. What does a database refer to?

2. What are the basic units of data storage?

3. What have different types of DBMS been developed for?

4. What does the information in many databases consist of?

5. Why have the databases become important in business life?

6. Why do businesses and government agencies employ “data mining” software?

## DATABASES

Database, also called electronic database, any collection of data, or information, that is specially organized for rapid search and retrieval by a computer. Databases are structured to facilitate the storage, retrieval, modification and deletion of data in conjunction with various data-processing operations. A *database management system* (DBMS) extracts information from the database in response to queries.

A database is stored as a file or a set of files on magnetic disk or tape, optical disk, or some other secondary storage device. The information in these files may be broken down into records, each of which consists of one or more fields. Fields are the basic units of data storage, and each field typically contains information pertaining to one aspect or attribute of the entity described by the database. Records are also organized into tables that include information about relationships between its various fields. Using keywords and various sorting commands, users can rapidly search, rearrange, group, and select the fields in many records to retrieve or create reports on particular aggregates of data.

*Queries* are the main way users retrieve database information. The power of a DBMS comes from its ability to define new relationships from the basic ones given by the tables and to use them to get responses to queries. Typically, the user provides a string of characters, and the computer searches the database for a corresponding sequence and provides the source materials in which those characters appear.

Many users of a large database must be able to manipulate the information within it quickly at any given time. Moreover, large business and other organizations tend to build up many independent files containing related and even overlapping data, and their data-processing activities often require the linking of data from several files. Several different types of DBMS have been developed to support these requirements: flat, hierarchical, network, relational, and object-oriented.

Early systems were arranged sequentially (i.e., alphabetically, numerically, or chronologically); the development of direct-access storage devices made possible random access to data via indexes. In *flat databases*, records are organized according to a simple list of entities; many simple databases for personal computers are flat in structure. The records in *hierarchical**databases* are organized in a treelike structure with each level of records, branching off into a set of smaller categories. Unlike hierarchical databases, which provide single links between sets of records at different levels, *network databases* create multiple linkages between sets by placing links, or pointers, to one set of records in another; the speed and versatility of network databases have led to their wide use within businesses and in e-commerce. *Relational databases* are used where associations between files or records cannot be expressed by links; a simple flat list becomes one row of a table, or “relation” and multiple relations can be mathematically associated to yield desired information. Various iterations of SQL (Structured Query Language) are widely employed in DBMS for relational databases. *Object-oriented databases* store and manipulate more complex data structures, called “objects”, which are organized into hierarchical classes that may inherit properties from classes higher in the chain; this database structure is the most flexible and adaptable.

The information in many databases consists of natural-language texts of documents; number-oriented databases primarily contain information such as statistics, tables, financial data, and raw scientific and technical data. Small databases can be maintained on personal-computer systems and may be used by individuals at home. These and larger databases have become increasingly important in business life, in part because they are now commonly designed to be integrated with other office software, including spreadsheet programs.

Typical commercial database applications include airline reservations, production management functions, medical records in hospitals, and legal records of insurance companies. The largest databases are usually maintained by governmental agencies, business organizations, and universities. These databases may contain texts of such materials as abstracts, reports, legal statutes, wire services, newspapers and journals, encyclopedias, and catalogs of various kinds. Reference databases contain bibliographies or indexes that serve as guides to the location of information in books, periodicals, and other published literature. Thousands of these publicly accessible databases now exist, covering topics ranging from law, medicine, and engineering to news and current events, games, classified advertisements, and instructional courses.

Increasingly, formerly separate databases are being combined electronically into larger collections known as *data warehouses*. Businesses and government agencies then employ “data mining” software to analyze multiple aspects of the data for various patterns. For example, a government agency might flag for human investigation a company or individual that purchased a suspicious quantity of certain equipment or materials, even though the purchases were spread around the country or through various subsidiaries.

*3. Read the text again and find the following.*

1) the basic units of data storage;

2) the most flexible and adaptable database structure;

3) typical commercial database applications;

4) the main way users retrieve database information;

5) specially organized collection of data or information;

6) large collections of data.

*4. In pairs discuss:*

1) features of spreadsheet programs;

2) applications of databases;

3) is it safe to keep your personal information in databases?

*5. Match the words (1 – 6) with the words (a – f) to make technical terms and translate them into Ukrainian.*

1) optical

2) a string of

3) spreadsheet

4) treelike

5) hierarchical

6) data

a) programs

b) storage

c) linkages

d) access

e) structure

f) database

7) random g) disk

8) multiple h) characters

*GRAMMAR: WORD BUILDING*

New words from existing ones are created in three main ways:

Affixation (adding a prefix or suffix) *e.g. volatile – non-volatile; date – update; erase – erasable; install – installation*

Conversion (turning a noun into a verb or verb into a noun) e.g. *network* (noun) – *network* (verb)

Compounding (putting two or more words together) *e.g. hand + held – handheld*

Compounds can be written as two separate words (e.g. *flash card*), as two words joined with a hyphen (*e.g*. *solid-state)* or as one word (*e.g. handheld*).

In pronunciation compounds normally have the main stress on the first part and the secondary stress on the second part (*e.g. video game*).

*6. Choose the necessary word form from those in brackets.*

1. Database is any (collect/collection) of data, or information that is specially organized for rapid search and (retrieve/retrieval) by a computer.
2. A (database / data base) management system (DBMS) extracts information from the (database /data base) in response to queries.
3. Records are also organized into tables that include information about (relationships/ relations) between its various fields.
4. Using keywords and (various/variable) sorting commands, users can rapidly search, rearrange, group, and select the fields in many records.
5. Large business and other organizations tend to build up many independent files (containing/contained) related and even overlapping data.
6. The development of (direct-access/direct access) storage devices made possible random access to data via indexes.

*WRITING*

*Nowadays a great amount of information is stored in electronic databases. Write about the advantages and disadvantages of this.*

**2.4. GRAPHICS AND DESIGN**

*SPEAKING AND VOCABULARY:**GRAPHICS AND DESIGN*

*1. Match the sentence beginnings (1 – 8) with the correct endings (a – h).*

1. A variety of file formats exist for

2. The image data is usually stored as

3. Raster images are normally opaque, but some formats

4. Interlacing allows users to see an image before

5. Various compression algorithms may be employed

6. Vector graphics formats store images as

7. Vector files can be easily manipulated

8. High-level design consists of developing an architectural structure for

a) a series of scan-lines, each representing one row of the image grid.

b) to reduce the physical size of a file.

c) encoding each type of image.

d) all the image data has been read.

e) mathematical representations of image elements, such as shapes or lines.

f) allow regions of an image to be transparent.

g) the software components, databases, user interface, and operating environment.

h) and rescaled without loss of quality.

*2. Read the text and answer these questions:*

1. How many approaches for digitally encoding static images exist?

2. What is the main difference between raster and vector graphics?

3. What issues need to beconsidered when using raster images?

4. How can transparency of a raster image be achieved?

5. What categories do graphics compression algorithms fall into?

6. Can vector files be easily manipulated, and rescaled without loss of quality?

7. What activities must be carried out during design?

8. What are the main web-design principles?

**GRAPHICS AND DESIGN**

Two distinct approaches exist for digitally encoding static images. These are known as *raster and vector graphics*. A further group of formats can store both raster and vector data within a single file, and are known as metafiles. A variety of file formats exist for encoding each type of image.

**Raster Graphics***.* A raster image comprises a two-dimensional grid of pixels, each pixel having a specific colour value. The image data is usually stored as a series of scan-lines, each representing one row of the image grid. Each scan-line comprises sets of consecutive values representing the colour of each pixel in the row. These scan-lines may be stored contiguously within the file, or be aggregated into strips or tiles, which can speed up the decoding and decompression of the image. A number of issues need to be considered when using raster images.

*Colour Depth*. Colour depth describes the number of distinct colours that can be displayed by a single pixel within a raster image, and is a function of the number of bits allocated to each pixel.

*Transparency.* Raster images are normally opaque, but some formats allow regions of an image to be transparent. This is useful when overlaying images, or creating icons. This effect is usually achieved by allocating 8 bits per pixel to an alpha channel, which can be set to any level of transparency from 0 (opaque) to 256 (completely transparent). Transparency is only supported by certain image formats.

*Interlacing*. Raster images are typically stored as a series of consecutive scan lines. However, image data can also be interlaced whereby the scan lines are stored out of sequence. In its simplest form, even rows might be stored first, followed by odd rows. The image would then be displayed in two passes, the first showing the even rows, and the second building up the complete image with the addition of the odd rows. Interlacing allows users to see an image before all the image data has been read, which can be helpful when the data is being downloaded from the Internet. It is only supported by certain file formats.

*Compression.*  Various compression algorithms may be employed to reduce the physical size of a file. Graphics compression techniques work by compressing the image information within a file, and are entirely distinct from file compression methods, such as WinZip, which compress the entire file bitstream. Graphics compression algorithms fall into two categories: ­ *Lossy compression* (such as JPEG) achieves its effect at the cost of a loss in image quality, by removing some image information. ­ *Lossless compression* techniques (such as CCITT Group 4) reduce size whilst preserving all of the original image information, and therefore without degrading the quality of the image.

**Vector Graphics.** Vector graphics formats store images as mathematical representations of image elements, such as shapes or lines. For example, a line segment might be defined in terms of the coordinates of its starting point, a direction, and a length. More complex shapes can be built up from simple shapes. Enclosed shapes can also be filled with colours. Some vector formats support 3-D objects as well, such as wire frame models. Vector formats are most commonly used in the field of Computer-Aided Design (CAD), since they are ideally suited to the creation of architectural and engineering drawings, maps, schematics, and charts. They also form the basis for 3-D modelling and animation. Vector files can be easily manipulated and rescaled without loss of quality. The size of a vector file is proportional to the complexity of the image (unlike raster images). Vector files do not usually support compression. However, vector file sizes are typically far smaller than the equivalent raster image.

**Metafiles**. The Computer Graphics Metafile format was developed by the International Standards Organization (ISO) and the American National Standards Institute (ANSI). It is an open, platform-independent format for the exchange of raster and vector data for technical applications. A metafile allows both raster and vector versions of an image to be stored within a single file.

**Systems design** is a model building endeavor, just as it was during systems analysis. As design decisions are made, especially at the detail level, those decisions are derived and documented by building models. The models may be quite informal, but they are the essence of design. For example, in *database design*, we identify which tables will be required and what fields will be in which table before we begin to build the tables with SQL statements. In *software design*, we decide which classes are the core classes and which are utility classes and what responsibilities (methods) each class will have. *User interface design* often requires storyboards or other visual models to make efficient workflow decisions. All of these systems design tasks are model building tasks.

The objective of the *design activities* is to design the solution system based on the requirements defined and decisions made during analysis. High-level design consists of developing an architectural structure for the software components, databases, user interface, and operating environment. Low-level design entails developing the detailed algorithms and data structures that are required for software development. Seven major activities must be completed during the design phase:

• Design and integrate the network.

• Design the application architecture.

• Design the user interfaces.

• Design the system interfaces.

• Design and integrate the database.

• Prototype for design details.

• Design and integrate the system controls.

Design activities are closely interrelated and generally are all done with substantial overlap. During design, it is often necessary to verify the correctness or workability of the proposed design. Again, one important verification method is to build working prototypes of parts of the system to ensure that it will function correctly in the operating environment. In addition, analysts can test and verify alternative design strategies by building prototypes of the new system. Sometimes, if the prototypes are built correctly, they can be saved and used as part of the final system.

**WEB-DESIGN**

Web site design draws from the guidelines and rules for designing the windows forms and browser forms. Many business systems today, including the RMO customer support system, make use of both technologies. Web sites also are used for corporate communication, customer information and service, online sales and distribution, and marketing. Because they are available 24 hours a day, 7 days a week, they need to interact seamlessly with customers.

*Web site design principles*. Because Web sites include so many facets, many designers take a broader view of Web site design principles. A Web design book by Joel Sklar suggests that the designer focus on three broad aspects of Web design: (1) designing for the computer medium, (2) designing the whole site, and (3) designing for the user.

*Designing for the Computer Medium.* It is important to remember that the Web site will be displayed on a computer screen and not on paper. Designers can select from a wide array of video display fonts, colors, and layouts, but the look of the site should flow from its function and the organization’s goals. Hypermedia

allow the user to navigate through the site in nonlinear ways, so the designer should take advantage of new ways to organize information.

*Designing the Whole Site.* The entire site must have unifying themes and a structure, and the theme should reflect the impression the organization wants to convey. For example, a site for adult, business-oriented users should use subdued colors, familiar business-oriented fonts, and structured linear columns. A site for children should combine bright colors, an open and friendly dynamic structure, and simple, appealing graphics. Four guidelines to consider include the following:

• Craft the look and feel of the pages to match the impression desired by the organization.

• Create smooth transitions between Web pages so users are clear about where they have been and where they are going.

• Lay out each page using a grid pattern to provide visual structure for related groups of information.

• Leave a reasonable amount of white space on each page between groups of information.

*Designing for the User.* It is important to focus Web design efforts on the users and their needs. If a feature will annoy or distract users, do not include it. It is sometimes difficult to know who the Web users will be, but if the purpose and objectives of the whole site are defined carefully, the designer can make better judgments.

*3. Read the text again and find the following.*

1) a series of scan-lines, each representing one row of the image grid;

2) the number of distinct colours that can be displayed by a single pixel within a raster image;

3) mathematical representations of image elements;

4) open, platform-independent format for the exchange of raster and vector data for technical applications;

5) major activities to be completed during the design phase.

*4. In pairs discuss:*

1) advantages of vector and raster graphics;

2) web site design principles;

3) systems design tasks.

*5. Match the words (1 – 8) with the words (a – h) to make technical terms and translate them into Ukrainian.*

1) static

2) two-dimensional

3) scan

4) colour

5) lossy

6) compression

a) lines

b) algorithm

c) compression

d) phase

e) shapes

f) value

7) enclosed g) grid

8) design h) image

*GRAMMAR: PHRASAL VERBS*

Phrasal verbs are usually two-word phrases consisting of ***verb + adverb*** *or* ***verb + preposition (e.g. look for, blow down)****.*

The meaning of some verbs can be easily understood (e.g. *look at, consist of*). Many phrasal verbs have an idiomatic meaning (*e.g. carry out/execute*)

Certain particles have similar meaning regardless of the verb (*on/off; in/out*)

When the preposition is associated with the verb, it must precede the object, not to follow it (*e.g. We must* ***try out*** *this program*).

A particle can follow or precede the direct object *(e.g. You must* ***fill in*** *this form. Or You must* ***fill*** *this form* ***in*)**.

*7. Complete these sentences with the correct form of phrasal verbs:*

1. The CPU carries (out/down/into) all the basic operations on the data.
2. Hundreds and thousands of networks make (on/up/into) the Internet.
3. LCD monitors can be run (off/into/from) of batteries which makes them ideal for laptops.
4. When you turn (off /on/out) your computer or an electrical outage occurs, whatever is stored in RAM is lost.
5. Any data stored in ROM remains there, even if the power is turned (off\on\out).
6. And the entire contents of RAM can be wiped (out/into/on) by a system crash.
7. The scan lines are stored (out/from/on) of sequence.
8. Graphics compression algorithms fall (under/on/into) two categories. ­
9. More complex shapes can be built (on/in/up) from simple shapes.

*WRITING*

*Write a report comparing two formats of graphics: raster and vector.*

**2.5. MULTIMEDIA**

*SPEAKING AND VOCABULARY:**MULTIMEDIA AND HYPERMEDIA*

*1. Match the sentence beginnings (1 – 8) with the correct endings (a – h).*

1. The media can be still pictures, sound, motion video, animation, and/or text items combined

2. In this system, items of information from all over the world were

3. The media elements are linked with

4. Multimedia and hypermedia systems come in a variety of

5. Digitized videos used to be difficult to produce and edit and were used primarily

6. Now anyone, even nontechnical consumers, can produce professional-looking

7. Hypermedia systems published as web page documents also represent

8. The medium on which multimedia is presented has become

a) hardware, software, and media configurations.

b) a powerful technology of the future.

c) in a product whose purpose is to communicate information.

d) to be logically connected with hypertext links.

e) to capture short video clips for use in multimedia/hypermedia authored.

f) less important than its purpose and the type of capability it offers.

g) buttons to click on or menus from which to select.

h) movies with a variety of special effects like fading and titles.

*2. Read the text and answer these questions:*

1. How can multimedia be defined?

2. What does hypermedia refer to?

3. What were the criteria of multimedia and hypermedia classification in the past?

4. How many multimedia/hypermedia formats are available now?

5. What are the most important features of the newest multimedia/hypermedia systems?

**MULTIMEDIA AND HYPERMEDIA**

We live in a multimedia world, surrounded by complex images, movement, and sound. So perhaps it is not surprising that part of our human evolution has focused on making our technology reflect the color and clamor of our surroundings.

*Multimedia* simply means “multiple media” or “a combination of media.” The media can be still pictures, sound, motion video, animation, and/or text items combined in a product whose purpose is to communicate information. *Hypermedia* refers to “linked media” that have their roots in a concept developed by Vannevar Bush (1986) in his landmark article “As We May Think.” In 1945, Bush proposed a “memex” machine that would let people quickly access items of information whose meanings were connected but which were stored in different places. In the 1960s, Ted Nelson coined the term *hypertext* to describe a proposed database system called Xanadu based on Bush’s idea (Boyle, 1997). In this system, items of information from all over the world were to be logically connected with hypertext links. For example, one could select “apple” and get information on all related concepts such as trees, fruit – even the Garden of Eden. The technology at that time was inadequate to produce Xanadu, but the idea was the forerunner of today’s hypermedia systems in which information stored in various media are connected (often via the Internet), thus the term hypermedia.

In current technologies such as Internet browsers and authoring systems, most multimedia products also are hypermedia systems. That is, the media elements are linked with buttons to click on or menus from which to select. Clicking on or selecting one item sends the user to other, related items. The combination of media such as video and audio with text makes them multimedia; the ability to get from one media/information element to another makes them hypermedia.

*Types of Multimedia and Hypermedia Systems.* Multimedia and hypermedia systems come in a variety of hardware, software, and media configurations and, until recently, were usually classified according to their primary storage equipment: interactive videodiscs (IVDs), CDROMs (compact disc–read-only memory), digital versatile discs (DVDs), and other technologies, including CD-I (compact disc–interactive), DVI (digital video interactive), and photo CDs (photographic compact discs). However, dramatic changes in the capabilities of presentation software and Internet multimedia formats, as well as the decline in use of videodisc systems, have changed the focus of this classification system. The medium on which multimedia is presented has become less important than its purpose and the type of capability it offers.

There are five kinds of multimedia/hypermedia formats. The first two are developed by companies and sold to educators and other consumers; the other three are authoring systems that educators and others can use to develop their own products.

*Commercial multimedia/hypermedia software packages*. These are pre-packaged products developed by software publishing companies and offer a variety of media, including animation, video, audio, and links to the Internet. The trend is for most software packages to include all these features.

*Commercial interactive videodisc packages*. Until the emergence of CD-ROM and DVD storage media, interactive videodiscs were the storage medium of choice for full-motion video in combination with text and still pictures. Because of the large number of IVD curriculum discs and videodiscs players that remain in schools, this technology is still in use.

*Authoring tools*: presentation software. This authoring software used to be linear and primarily a combination of text, still pictures, and limited audio and animation. But it has grown in capability and now offers branching capabilities and the ability to include many of the same features as published products (e.g. embedded audio and video clips).

*Authoring tools*: video production and editing systems. Digitized videos used to be difficult to produce and edit and were used primarily to capture short video clips for use in multimedia/hypermedia authored. New video editing systems have changed this. Now anyone, even nontechnical consumers, can produce professional-looking movies with a variety of special effects like fading and titles.

*Authoring tools*: multimedia/hypermedia authoring systems. These systems, too, have come a long way since the first versions. They are increasingly capable, allowing users to include many of the features they see in professional products with substantially greater ease. Hypermedia systems published as web page documents also represent a powerful technology of the future.

*3. Read the text again and find the following:*

1) combination of media such as video and audio with text;

2) linked media;

3) types of multimedia and hypermedia systems;

4) linear and primarily a combination of text, still pictures, and limited audio and animation.

*4. In pairs discuss:*

1) business applications of multimedia;

2) the use of multimedia and interactive games;

3) multimedia applications in education.

*5. Match the words (1 – 6) with the words (a – f) to make technical terms and translate them into Ukrainian.*

1) interactive

2) authoring

3) hypertext

4) videodisc

5) multimedia

6) presentation

a) links

b) systems

c) packages

d) videodiscs

e) software

f) formats

*GRAMMAR: PREFIXES IN IT-TERMINOLOGY*

|  |  |  |
| --- | --- | --- |
| ***Prefix*** | ***Meaning*** | ***Example*** |
| *bi* | *two* | *bi-directional* |
| *uni* | *one* | *uni-directional* |
| *tera* | *10 12* | *terabyte* |
| *giga* | *10 9* | *gigahertz* |
| *mega* | *10 6* | *megahertz* |
| *kilo* | *10 3* | *kilobyte* |
| *milli* | *10 -3* | *millisecond* |
| *micro* | *small* | *microcomputer* |
| *macro* | *large* | *macroinstruction* |
| *multi* | *many* | *multimedia* |
| *anti* | *against* | *anti-virus* |
| *infra* | *below* | *infrared* |
| *intra* | *within* | *intranet* |
| *inter* | *between* | *internet* |
| *hyper* | *above, beyond* | *hyperlink* |
| *tele* | *distant, far* | *telecommunications* |
| *auto* | *by itself* | *automated* |
| *cyber* | *machine control* | *cyberspace* |
| *super* | *higher in quantity or degree* | *superhighway* |

*6. Find an IT term for each of these definitions. Each term includes one of the prefixes listed above.*

1) working at a distance;

2) a system of numbers with 2 as its base;

3) a way of communicating between a user and a computer;

4) describes a program which allows two way communication between a user and computer;

5) set of computer instructions operating as one unit;

6) having many different modes of input;

7) a computer higher in scale than any other;

8) a machine which provides cash to bank customers without requiring a human operator ( an a…. Teller Machine);

9) a very small but powerful processor;

10) a word-processing feature which corrects by itself.

*WRITING*

*Write an essay about the power of multimedia today and your predictions about the use of multimedia for the next few decades.*

**UNIT 3. INFORMATION SYSTEMS**

**3.1. Types of information systems**

**3.2. System development**

**3.3. Structured system development**

**3.4. Information engineering**

**3.5. The object-oriented approach**

**3.6. Programming languages**

**3.1. TYPES OF INFORMATION SYSTEMS**

*SPEAKING AND VOCABULARY: TYPES OF INFORMATION SYSTEMS*

*1. Match the sentence beginnings (1 – 8) with the correct endings (a – h).*

1. An information system is a collection of interrelated components that

2. A sales management system collects information about

3. A customer relationship management system incorporates processes that

4. Accounting and financial management systems record accounting information needed to produce

5. Human resource management systems include processes

6. A collaboration support system enables

7. A business intelligence system supports

8. An important aspect of all types of information systems is

a) customers, sales, products, and inventory levels.

b) financial statements and other reports used by investors and creditors.

c) their data integration.

d) collect, process, store, and provide as output the information needed to complete a business task.

e) concerned with employees, such as payroll, health insurance, pensions, hiring, and training.

f) strategic planning and executive decision making.

g) geographically distributed personnel to collaborate on projects and tasks.

h) support marketing, sales, and service operations involving direct and indirect customer interaction.

*2. Read the text and answer these questions:*

1. What is the main function of an information system?

2. What kind of information does a sales management system collect?

3. What types are information systems classified into?

4 What organizations do accounting and financial management and human resource management systems interact with?

5. What should be done by organization in order to adopt enterprise resource planning systems?

6. What is the most important aspect of all types of information systems?

**TYPES OF INFORMATION SYSTEMS**

*A system* is a collection of interrelated components that function together to achieve some outcome. *An information system* is a collection of interrelated components that collect, process, store, and provide as output the information needed to complete a business task.

A payroll system, for example, collects information on employees and their work, processes and stores that information, and then produces paychecks and payroll reports (among other things) for the organization. A sales management system collects information about customers, sales, products, and inventory levels. It enables customers and sales personnel to create and modify sales orders, select payment methods, and output sales information for tasks such as generating financial statements, computing bonuses, and scheduling production.

*Types of information systems*

Because organizations perform many different types of activities, many types of information systems exist – all of which can be innovative and use the latest technologies. A *customer relationship management* *(CRM) system* incorporates processes that support marketing, sales, and service operations involving direct and indirect customer interaction. A *supply chain management* *(SCM) system* incorporates processes that seamlessly integrate product development, product acquisition, manufacturing, and inventory management. Most modern organizations now manage sales and service via a single system, enable Web-based ordering and account management via consumer-oriented Web sites, and employ automated interfaces for business customers that directly connect one organization’s SCM to other organizations’ CRMs. Integration across organizational boundaries has increased the speed and efficiency of business transactions and enabled modern business practices such as just-in-time delivery of raw materials in manufacturing organizations and direct shipment from manufacturers to end users by third-party resellers.

Other systems that interface with external entities include *accounting and financial management* *(AFM) systems* and *human resource management* (HRM) *systems*. AFM systems record accounting information needed to produce financial statements and other reports used by investors and creditors. AFM systems also include financial functions such as cash management, cash flow forecasting, and securities management. HRM systems include processes concerned with employees, such as payroll, health insurance, pensions, hiring, and training. AFM and HRM systems are partly governed by external regulations and must frequently interact with regulatory authorities in areas such as taxes, public financial markets, and occupational health and safety.

Organizations also have information systems with few or no interactions with external entities. A *manufacturing management system* controls internal production processes that turn raw materials into finished goods. A *knowledge management system* *(KMS)* supports the storage of and access to d

ocuments from all parts of the organization. It enables rapid communication of policies, procedures, and data and helps ensure continuity of knowledge despite changes in personnel assignments.

A *collaboration support system (CSS)* enables geographically distributed personnel to collaborate on projects and tasks. CSSs encompass a variety of technologies, including voice communications, video-conferencing, project management and scheduling tools, and Wiki technology that enables Web-based management of documents by project participants. A *business intelligence system* supports strategic planning and executive decision making. It enables users to organize internal and external data about customers, suppliers, competitors, and economic conditions for use in statistical analysis, simulations, and other forms of planning.

Today, many companies use *enterprise resource planning (ERP)* systems that incorporate most or all of the system types described previously. Software vendors such as SAP, Oracle, and IBM offer comprehensive packages for companies in specific industries. To adopt an ERP solution, the company must carefully study its existing processes and information needs and then determine which ERP vendor provides the best match. ERP systems are so complex that an organization must often commit nearly everyone in the information systems department and throughout the organization to research options. They are also very expensive, both in initial costs and support costs. Extensive change is involved for management and for staff. After the decision is made to adopt an ERP system, it is very difficult to return to the old ways of doing business, or to the old systems.

An important aspect of all types of information systems is their data integration. For example, order data originally captured by the CRM system is needed by the SCM system to drive purchasing, the manufacturing management system to drive production scheduling, the AFM system for accounting and to help determine near-term financing requirements, and the business intelligence system to drive estimates of future sales and profitability. Data sharing among all these systems is made possible by databases – centrally managed collections of data that can store large amounts of information and make it accessible to many users and systems at the same time.

*3. Read the text again and find the following:*

1)a system;

2) an information system;

3) accounting and financial management (AFM) system;

4) human resource management (HRM) system;

5) knowledge management system (KMS);

6) collaboration support system (CSS);

7) enterprise resource planning (ERP) system.

*4. In pairs discuss:*

1) pros and cons of different information systems;

2) predictions about future changes in storing and processing information.

*5. Match the words (1 – 6) with the words (a – f) to make technical terms and translate them into Ukrainian.*

1) interrelated

2) collect

3) automated

4) voice

5) information

6) software

a) interface

b) communication

c) vendors

d) components

e) integration

f) information

7) data g) sharing

*GRAMMAR: PRESENT PERFECT SIMPLE VS. PRESENT PERFECT CONTINUOUS*

When we use *present perfect continuous*, we are interested in the activity, how long something has been happening whereas with present perfect we are concerned about its result, not the activity itself. We use *perfect continuous* to say *how long* something has been happening (*e.g. How long* ***have*** *you* ***been reading*** *this book?*)

With simple perfect we say *how much, how many or how many times* (*e.g. How many pages* ***have*** *you* ***read****?)*

*6. Put the words in brackets into the correct form (present perfect or present perfect continuous).*

1. Our company (to use) different types of information systems for 3 years.

2. A lot of information about customers, sales, products, and inventory levels already (collect) due to the use of a sales management system.

3. How many information systems (develop) recently?

4. Some organizations (interact) with external entities for a long time.

5. Integration across organizational boundaries (lead) to the increasing of the speed and efficiency of business transactions.

6. Geographically distributed personnel (collaborate) on the projects since January.

*WRITING*

*Write about the benefits of business and commercial applications of information systems. Give examples of the use of these applications nowadays.*

**3.2. SYSTEM DEVELOPMENT**

*SPEAKING AND VOCABULARY: SYSTEM DEVELOPMENT*

1. *Match the sentence beginnings (1 – 8) with the correct endings (a – h).*

1. The methodology used by the organization determines how

2. A model is a representation of an important

3. Some models are

4. Models for information systems are not yet as

5. Tools might be simple drawing programs

6. The project management tool creates a model of

7. Programmers should be familiar with integrated development environments that 8. A technique often includes

a) aspect of the real world.

b) for creating diagrams.

c) graphical representations of important details.

d) include many tools to help with programming tasks.

e) prescriptive or adaptive the approach to a system development project should be.

f) the project tasks and task dependencies.

g) step-by-step instructions for creating a model.

h) standardized or precise as aerospace models.

1. *Read the text and answer these questions:*

1. What does a system development methodology provide?

2. What does the methodology, used by the organization, determine?

3. Why do most people want the methodology to be flexible?

4. What do models, used in system development, include?

5. What are tools usually designed for?

6. What does a technique often include?

**SYSTEM DEVELOPMENT**

A *system development methodology* provides guidelines to follow for completing every activity in the systems development life cycle, including specific models, tools, and techniques. Some methodologies are homegrown, developed by systems professionals in the company based on their experience, the other ones are purchased from consulting firms or other vendors.

Some methodologies (whether homegrown or purchased) contain written documentation that can fill a bookcase. The documentation defines everything the developers might need to produce at any point in the project, including how documentation should look and what reports to management should contain. Other methodologies are much more informal; one document will contain general descriptions of what should be done. Sometimes the methodology that a company adopts is “just follow some sort of methodology,” but such freedom of choice is becoming rare. Most people want the methodology to be flexible, so that it can be adapted to many different types of projects and systems. The methodology used by the organization determines how prescriptive or adaptive the approach to a system development project should be.

Anytime people need to record or communicate information, in any context, it is very useful to create a *model.* A model is a representation of an important aspect of the real world. Sometimes the term abstraction is used because we abstract (separate out) an aspect of particular importance to us.

Some models are physically similar to the real product. Some models are graphical representations of important details. Some models are abstract mathematical notations. Each emphasizes a different type of information.

Models for information systems are not yet as standardized or precise as aerospace models. Models used in system development include representations of inputs, outputs, processes, data, objects, object interactions, locations, networks, and devices, among other things. Most of the models are graphical models, which are drawn representations that employ agreed-upon symbols and conventions. These are often called diagrams and charts. You have probably drawn models showing program logic using flowcharts.

Another kind of model important to develop and use is a project-planning model, such as Gantt charts. These models represent the system development project itself, highlighting its tasks and task completion dates. Another model related to project management is a chart showing all of the people assigned to the project.

A *tool* in the context of system development is software support that helps create models or other components required in the project. Tools might be simple drawing programs for creating diagrams. They might include a database application that stores information about the project, such as data flow definitions or written descriptions of processes. A project management software tool, such as Microsoft Project, is another example of a tool used to create models. The project management tool creates a model of the project tasks and task dependencies.

Tools have been specifically designed to help system developers. Programmers should be familiar with integrated development environments (IDEs) that include many tools to help with programming tasks – smart editors, context-sensitive help, and debugging tools. Some tools can generate program code for the developer. Some tools reverse-engineer old programs – generating a model from the code so that the developer can determine what the program does, in case the documentation is missing (or was never done). Visual modeling tools are available to systems analysts to help them create and verify important system models, often generating program code.

A *technique* in system development is a collection of guidelines that help an analyst complete a system development activity or task. A technique often includes step-by-step instructions for creating a model, or it might include more general advice for collecting information from system users. Some examples include data-modeling techniques, software-testing techniques, user-interviewing techniques, and relational database design techniques. Sometimes a technique applies to an entire life cycle phase and helps you create several models and other documents.

1. *Read the text again and find the following:*

1) a representation of an important aspect of the real world;

2) software support that helps create models or other components required in the project;

3) collection of guidelines that help an analyst complete a system development activity or task.

1. *In pairs discuss:*

1) models for information systems;

2) the methodology used by the organization;

3) a technique in system development.

1. *Match the words (1 – 6) with the words (a – f) to make technical terms and translate them into Ukrainian.*

1) system

2) objects

3) graphical

4) project

5) debugging

6) smart

7) program

8) step-by-step

a) representations

b) management

c) tools

d) code

e) interaction

f) development

g) instructions

h)editors

*GRAMMAR: PAST PERFECT*

Past perfect (*had+ past participle*) is used to speak about past action, occurred prior to some other past action or before a stated past time (*e.g. When I came to the party she* ***had*** *already* ***gone*** *home. He* ***had done*** *all his work by 3 o’clock*).

*6. Use the correct past tenses*

1. They (develop) guidelines for conducting every operation long before they (start) research.

2. Systems professionals (develop) some methodologies based on their experience in the company.

3. New model for information systems (develop) by the end of the year.

4. The methodology used by the organization (determine) the approach, which was applied.

5. This device (use) by many people long before the scientist (invent) the term for it.

6. The research council (not approve) the technique, which they (develop).

*WRITING*

*Write a review to the scientific journal. Describe a concept and principles of system development.*

**3.3. STRUCTURED SYSTEM DEVELOPMENT**

*SPEAKING AND VOCABULARY: STRUCTURED SYSTEM DEVELOPMENT*

*1. Match the sentence beginnings (1 – 7) with the correct endings (a – g).*

1. The structured design technique defines different degrees of coupling and cohesion and provides a way of

2. Quality is defined in terms of how easily the design

3. System requirements define what the system must do in great detail, but without

4. The most recent variation of structured analysis defines systems processing requirements by

5. As information systems continued to become increasingly complex through the 1970s

6. Each function performed by the system might be made up of

7. The analyst takes each of these activities and creates a data flow diagram

a) can be understood and modified later when the need arises.

b) each system involved many different functions.

c) ) evaluating the quality of the design before the programs are actually written.

d) dozens of separate programs.

e) identifying all of the events that will cause the system to react in some way.

f) showing the processing details, including inputs and outputs.

g) committing to one specific technology.

*2. Read the text and answer these questions:*

1. What techniques make up the structured approach?

2. When was the structured programming technique developed?

3**.** What doeseach step in the program execution consist of**?**

4. What was the structured design technique developed for?

5. What are the principles of structured design?

6. What was the structured analysis technique developed for?

**STRUCTURED SYSTEM DEVELOPMENT**

Structured analysis, structured design, and structured programming are the three techniques that make up the structured approach. Sometimes these techniques are collectively referred to as the structured analysis and design technique (SADT). The structured programming technique, developed in the 1960s, was the first attempt to provide guidelines to improve the quality of computer programs. The structured design technique was developed in the 1970s to make it possible to combine separate programs into more complex information systems. The structured analysis technique evolved in the early 1980s to help clarify requirements for a computer system before developers designed the programs.

*Structured Programming*. High-quality programs not only produce the correct outputs each time the program runs, they make it easy for other programmers to read and modify the program later. And programs need to be modified all the time. A structured program is one that has one beginning and one ending, and each step in the program execution consists of one of three programming constructs:

• A sequence of program statements

• A decision where one set of statements or another set of statements executes

• A repetition of a set of statements

*Structured Design*. As information systems continued to become increasingly complex through the 1970s, each system involved many different functions. Each function performed by the system might be made up of dozens of separate programs. The structured design technique was developed to provide some guidelines for deciding what the set of programs should be, what each program should accomplish, and how the programs should be organized into a hierarchy.

Two main principles of structured design are that program modules should be designed so they are (1) loosely coupled and (2) highly cohesive. Loosely coupled means each module is as independent of the other modules as possible, which allows each module to be designed and later modified without interfering with the performance of the other modules. Highly cohesive means that each module accomplishes one clear task. That way, it is easier to understand what each module does and to ensure that if changes to the module are required, none will accidentally affect other modules.

The structured design technique defines different degrees of coupling and cohesion and provides a way of evaluating the quality of the design before the programs are actually written. As with structured programming, quality is defined in terms of how easily the design can be understood and modified later when the need arises.

*Modern Structured Analysis.* Because the structured design technique requires the designer to know what the system should do, techniques for defining system requirements were developed. System requirements define what the system must do in great detail, but without committing to one specific technology. By deferring decisions about technology, the developers can sharply focus their efforts on what is needed, not on how to do it. If these requirements are not fully and clearly worked out in advance, the designers cannot possibly know what to design.

The structured analysis technique helps the developer define what the system needs to do (the processing requirements), what data the system needs to store and use (data requirements), what inputs and outputs are needed, and how the functions work together as a whole to accomplish tasks. The key graphical model of the system requirements used with structured analysis is called the data flow diagram (DFD), and it shows inputs, processes, storage, and outputs, and the way they function together.

The most recent variation of structured analysis defines systems processing requirements by identifying all of the events that will cause the system to react in some way. For example, in an order-entry system, if a customer orders an item, the system must process a new order (a major system activity). Each event leads to a different system activity. The analyst takes each of these activities and creates a data flow diagram showing the processing details, including inputs and outputs.

*3. Read the text again and find the following:*

1) techniques that make up the structured approach;

2) main principles of structured design;

3) the data flow diagram.

*4. In pairs discuss:*

1) development stages of structured approach;

2) steps in structured programming;

3) the most recent variation of structured analysis.

*5. Match the words (1 – 6) with the words (a – f) to make technical terms and translate them into Ukrainian.*

1) structured

2) design

3) correct

4) program

5) data

6) processing

a) system

b) execution

c) requirements

d) analysis

e) technique

f) outputs

7) order-entry g) flow

*GRAMMER:* *MODALS NEED, OUGHT*

We use modal verbs to add extra meaning to the main verb. Mostly they are followed by the infinitive without *to*.

*Need* expresses necessity. As a modal verb *need* is followed by the infinitive without *to.* *Needn’t* means *don’t have* or *don’t need to* and is used to express a lack of obligation *(e.g. You need not trouble about that at all*)

*Ought* expresses moral obligation, advisability. *Ought* is followed by the infinitive with *to* *(e.g. He ought to be able to do something.)*

*6. Complete these sentences with suitable modal verbs (need or ought).*

1. You (\_\_\_\_not) learn HTML in order to build your own website.

2. Before going live you (\_\_\_\_) check that all the links work.

3. Programs (\_\_\_\_\_) to be modified all the time.

4. Nowadays you (\_\_\_\_\_) learn how to use HTML codes. Web design software converts a visual layout into HTML code.

5. I’ll take your laptop. I (\_\_\_\_) print this report.

6. We (\_\_\_\_\_) wait for the manager of the project.

*WRITING*

*Write a short summary of the text, highlighting the three techniques of the structured approach.*

**3.4. INFORMATION ENGINEERING**

*SPEAKING AND VOCABULARY: INFORMATION ENGINEERING*

*1. Match the sentence beginnings (1 – 8) with the correct endings (a – h).*

1. Each new system project begins by using

2. The information engineering approach focuses much more on

3. The processing model of information engineering is

4. A final major difference with information engineering is the more complete life cycle support it provides

5. Because they lacked flexibility, the tools that supported information engineering were

6. By the 1990s, fewer companies were using information engineering exclusively, although

7. The information engineering approach refines many of the concepts of the structured approach into

8. Both approaches define information systems requirements, design information systems, and

a) less useful with smaller desktop applications and client/server applications.

b) through the use of an integrated tool.

c) the defined activities and data entities created during strategic systems planning.

d) many of the concepts and techniques continue to be used.

e) data than the structured approach.

f) a rigorous and comprehensive methodology.

g) construct information systems by looking at processes, data, and the interaction of the two.

h) similar to a data flow diagram.

*2. Read the text and answer these questions:*

1. What does information engineering mean?

2. What does the application architecture plan include?

3. What is created at each step of strategic systems planning?

4. What does the information engineering approach focus on?

5. What is the process dependency diagram similar to?

6. What is the difference between information engineering and structured approaches?

**INFORMATION ENGINEERING**

Information engineering is a refinement to structured development that begins with overall strategic planning to define all of the information systems that the organization needs to conduct its business (the application architecture plan). The plan also includes a definition of the business functions and activities that the systems need to support the data entities about which the systems need to store information, and the technological infrastructure that the organization plans to use to support the information systems.

Each new system project begins by using the defined activities and data entities created during strategic systems planning. Then the activities and data are refined as the project progresses. At each step, the project team creates models of the processes, the data, and the ways they are integrated.

The type of data needed to conduct the business changes very little over time, but the processes followed to collect data change frequently. Therefore, the information engineering approach focuses much more on data than the structured approach. Just as the structured approach includes data requirements, information engineering includes processes, too. The processing model of information engineering – the process dependency diagram – is similar to a data flow diagram, but it focuses more on which processes are dependent on other processes and less on data inputs and outputs. Events trigger the processes, as with modern structured analysis.

A final major difference with information engineering is the more complete life cycle support it provides through the use of an integrated tool. The tool helps automate as much of the work as possible. It also forces the analyst to follow the information engineering approach faithfully, sometimes at the expense of flexibility.

Information engineering is mainly credited to James Martin, who wrote several books on information engineering and developed tools to support it. By the late 1980s, information engineering was very popular for large, mainframe systems. But because they lacked flexibility, the tools that supported information engineering were less useful with smaller desktop applications and client/server applications. By the 1990s, fewer companies were using information engineering exclusively, although many of the concepts and techniques continue to be used, particularly the approach to planning and the emphasis on data modeling.

The information engineering approach refines many of the concepts of the structured approach into a rigorous and comprehensive methodology. Both approaches define information systems requirements, design information systems, and construct information systems by looking at processes, data, and the interaction of the two. The traditional approach, in one version or another, is still widely used for information system development, although many information systems projects are now using object-oriented technology – which requires a completely different approach.

*3. Read the text again and find the following:*

1) refinement to structured development;

2) the processing model of information engineering;

3) overall strategic planning to define all of the information systems.

*4. In pairs discuss:*

1) stages of the system project development;

2) differences between information engineering and structured approaches.

*5. Match the words (1 – 8) with the words (a – h) to make technical terms and translate them into Ukrainian.*

1) processing a) engineering

2) information b) applications

3) technological c) systems

4) integrated d) infrastructure

5) mainframe e) methodology

6) data f) tool

7) desktop g) modal

8) comprehensive h) entities

*GRAMMAR: WAYS OF CONTRASTING IDEAS*

The following linking words are used to contrast or compare notions, processes or ideas in the same sentence: ***but,*** w***hereas/while, although/though*** *e.g.:*

***Though*** *the model has been recently developed, it needs to be updated.* ***Whereas*** *he was getting involved in this project, the research was carried out).*

We use ***however, nevertheless, on the other hand, instead, instead of, unlike, compared with*** to link two different sentences or compare two ideas e.g.:

*He was good at structured analysis.* ***However,*** *he didn’t manage to solve the problem arisen.*

*This problem is vital.* ***Nevertheless,*** *some scientists consider that it cannot be investigated nowadays.*

*7. Rewrite these sentences to express the same or similar contrasts, using the words in brackets.*

1. He earns $10000 a month but she gets at least 30000. (whereas)

2. Everyone worked hard but we lost the contest. (although)

3. His first response was to say no. But later he changed his mind. (however)

4. English is understood all over the world but Turkish is spoken by only a few people outside Turkey. (while)

5. Information engineering is a refinement to structured development. It begins with overall strategic planning to define all of the information systems. (though).

6. The traditional approach is still widely used for information system development. Many information systems projects are now using object-oriented technology. (although)

7. By the late 1980s, information engineering was very popular for large, mainframe systems. The tools that supported information engineering were less useful with smaller desktop applications and client/server applications. (although)

8. The processing model of information engineering is similar to a data flow diagram. It focuses more on which processes are dependent on other processes and less on data inputs and outputs. (although)

*WRITING*

*Being a team worker is more important than to be a brilliantly creative person. Give your reasons.*

**3.5. THE OBJECT-ORIENTED APPROACH**

*SPEAKING AND VOCABULARY: THE OBJECT-ORIENTED APPROACH*

1. *Match the sentence beginnings (1 – 8) with the correct endings (a – h).*

1. The object-oriented approach began with the development of

2. In the 1970s, the Smalltalk language was developed

3. Simula was used to create computer simulations involving

4. Object-oriented programming (OOP) consists of writing statements in a programming language

5. Object-oriented design (OOD) defines all of the additional types of objects necessary

6. The object-oriented approach yields several key benefits

7. Almost all systems use menus, dialog boxes, windows, and buttons, but many systems within the same company also

8. Quite a few traditional concepts are simply repackaged

a) to communicate with people and devices in the system.

b) “objects” such as ships, buoys, and tides in fjords.

c) to solve the problem of creating graphical user interfaces (GUIs) that involved “objects”.

d) among them naturalness and reuse.

e) in the object-oriented approach.

f) to define what each type of object does.

g) the Simula programming language in Norway in the 1960s.

h) use customer, product, and invoice classes that can be reuse.

*2. Read the text and answer these questions:*

1. How does the object-oriented approach view an information system?

2. What was Simula programming language used for?

3. What are the other object-oriented languages?

4. What is the object-oriented approach based on?

5. What are the advantages of the object-oriented approach?

**THE OBJECT-ORIENTED APPROACH**

An entirely different approach to information systems, the object-oriented approach, views an information system as a collection of interacting objects that work together to accomplish tasks. Conceptually, there are no processes or programs; there are no data entities or files. The system consists of objects. An object is a thing in the computer system that is capable of responding to messages. This radically different view of a computer system requires a different approach to systems analysis, systems design, and programming.

The object-oriented approach began with the development of the Simula programming language in Norway in the 1960s. Simula was used to create computer simulations involving “objects” such as ships, buoys, and tides in fjords. It is very difficult to write procedural programs that simulate ship movement, but a new way of programming simplified the problem.

In the 1970s, the Smalltalk language was developed to solve the problem of creating graphical user interfaces (GUIs) that involved “objects” such as pull-down menus, buttons, check boxes, and dialog boxes. More recent object-oriented languages include C++, Java, and C#. These languages focus on writing definitions of the types of objects needed in a system, and as a result, all parts of a system can be thought of as objects, not just the graphical user interface.

Because the object-oriented approach views information systems as collections of interacting objects, object-oriented analysis (OOA) defines all of the types of objects that do the work in the system and shows what user interactions, called use cases, are required to complete tasks. Object-oriented design (OOD) defines all of the additional types of objects necessary to communicate with people and devices in the system, shows how the objects interact to complete tasks, and refines the definition of each type of object so it can be implemented with a specific language or environment. Object-oriented programming (OOP) consists of writing statements in a programming language to define what each type of object does.

An object is a type of thing – a customer or an employee, as well as a button or a menu. Identifying types of objects means classifying things. Some things, such as customers, exist both outside the system (the real customer) and separately inside the system (a computer representation of a customer). A classification or “class” represents a collection of similar objects; therefore, object-oriented development uses a class diagram to show all of the classes of objects in the system. For every class, there may be more specialized sub-classes. For example, a savings account and a checking account are two special types of accounts (two subclasses of the class Account). Similarly, a pull-down menu and a pop-up menu are two special types of menus. Subclasses exhibit or “inherit” characteristics of the class above them.

The object-oriented approach yields several key benefits, among them naturalness and reuse. The approach is natural – or intuitive – for people, because they tend to think about the world in terms of tangible objects. It is less natural to think about complex procedures found in procedural programming languages. Also, because the object-oriented approach involves classes of objects, and many systems in the organization use the same objects, these classes can be used over and over again whenever they are needed. For example, almost all systems use menus, dialog boxes, windows, and buttons, but many systems within the same company also use customer, product, and invoice classes that can be reused. There is less need to “reinvent the wheel” to create an object. Clearly, the object-oriented approach is quite different from the traditional approach. But in other ways, quite a few traditional concepts are simply repackaged in the object-oriented approach.

*3. Read the text again and find the following:*

1) a thing in the computer system that is capable of responding to messages;

2) object-oriented languages;

3) a collection of interacting objects;

4) a collection of similar objects.

*4. In pairs discuss:*

1) structure of a system;

2) how things can be classified;

3) the essence of the object-oriented approach.

*5. Match the words (1 – 7) with the words (a – g) to make technical terms and translate them into Ukrainian.*

1) interacting a) approach

2) object-oriented b) language

3) programming c) simulations

4) pull-down d) programs

5) computer e) boxes

6) procedural f) menu

7) dialog g) objects

*GRAMMAR: FUTURE FORMS*

We use ***will*** when we make predictions about future but we are not talking about arrangements. We decide to do something at the time of speaking (*e.g. He* ***will*** *help you with this research*).

We use  ***be going to*** to describe future actions which we have already decided to do (e.g. I ***am going*** ***to*** begin this investigation).

We use the future continuous ***will be doing*** to say that we will be in the progress of doing something at a certain time in the future (*e.g. He* ***will be conducting*** *his research at that time*).

We use the future perfect ***will have done*** to say that something will already have happened before a certain time in the future (*e.g. They* ***will have developed*** *a new technique by the end of the month).*

*6. Complete the sentences with the correct future form of the word in brackets*

1. Gestural interfaces *(allow)* people to control displays, computers, or other devices without touching them by the midst of the 21st century.

2. I can’t do this work tomorrow. I (fix) my laptop.

3. To solve this task, you (require) quite a different approach to the methodology.

4. The fifth generation of computers (base) on logical inference.

5. This problem (solve) surely with the use of artificial intelligence.

6. We (begin) this investigation next week.

7. In ten years this job (replaced) by the machine.

8. The task (be) an interesting one for experts.

*WRITING*

*Write a report comparing traditional and object-oriented approach to system development.*

**3.6. PROGRAMMING LANGUAGES**

*SPEAKING AND VOCABULARY:* *PROGRAMMING LANGUAGES*

*1. Match the sentence beginnings (1 – 8) with the correct endings (a – h).*

1. The data description and manipulation facilities of a programming language should

2. A significant part of the software engineer’s task is concerned with how

3. In recent years, increasing attention has been given to

4. It is important to realize that programming languages are

5. A high-level language, such as COBOL, Visual Basic or C#, is said to be

6. Programming languages should also display

7. Procedures can be thought of as extending of the statements of the language, while

8. When a procedure is called, it achieves its effect by

a) problem-oriented and to reduce software production and maintenance costs.

b) very difficult to evaluate and compare.

c) modifying the data in the program which called it.

d) the problem of providing improved data abstraction facilities for programmers.

e) allow the programmer to represent “real-world” objects easily and faithfully.

f) to model, within a program, objects from some problem domain.

g) a high degree of orthogonality.

h) functions can be thought of as extending of the operators of the language.

*2. Read the text and answer these questions:*

1. What are the programming languages used for?

2. What programming languages do you use?

3. How are the programming languages classified?

4. What does the word *orthogonality* mean?

5. What are the basic procedural abstraction primitives?

6. What does the procedural abstraction allow a programmer to do?

**PROGRAMMING LANGUAGES**

Everyone involved in programming has their favorite programming language, or language feature they would like to have available. There are many languages, each with their proponents. A significant part of the software engineer’s task is concerned with how to model, within a program, objects from some problem domain. Programming, after all, is largely the manipulation of data. In the words of Nicklaus Wirth, the designer of Pascal, “Algorithms + Data Structures = Programs” – which asserts the symbiosis between data. The data description and manipulation facilities of a programming language should therefore allow the programmer to represent “real-world” objects easily and faithfully. In recent years, increasing attention has been given to the problem of providing improved data abstraction facilities for programmers.

It is important to realize that programming languages are very difficult to evaluate and compare. For example, although it is often claimed that language X is a general purpose language, in practice languages tend to be used within particular communities. Thus, COBOL has been the preferred language of the information systems community, FORTRAN, the language of the scientists and engineers, C, the language of the systems programmers and Ada, the language for developing real-time or embedded computer systems. COBOL is not equipped for applications requiring complex numerical computation, just as the data description facilities in FORTRAN are poor and ill suited to information systems applications.

Programming languages are classified in many ways, for example, “high-level” or “low-level”. A high-level language, such as COBOL, Visual Basic or C#, is said to be problem-oriented and to reduce software production and maintenance costs. A low-level language, such as assembler, is said to be machine-oriented, facilitating the programmers’ complete control over the efficiency of their programs. Between high- and low-level languages, another category, the systems implementation language or high-level assembler, has emerged. Languages such as C attempt to bind into a single language the expressive power of a high-level language and the ultimate control which only a language that provides access at the register and primitive machine instruction level can provide.

Languages may also be classified using other concepts, such as whether they are weakly or strongly typed.

Programming languages should also display a high degree of orthogonality. This means that it should be possible to combine language features freely; special cases and restrictions should not be prevalent. *Java* and similar languages distinguish between two types of variables – built-in primitive types and proper objects. This means that these two groups must be treated differently, for example, when they are inserted into a data structure. A lack of orthogonality in a language has an unsettling effect on programmers; they no longer have the confidence to make generalizations and inferences about the language.

It is no easy matter to design a language that is simple, clear and orthogonal. Indeed, in some cases these goals would seem to be incompatible with one another. A language designer could, for the sake of orthogonality, allow combinations of features that are not very useful. While we await the simple, clear, orthogonal programming language of the future, these concepts remain good measures with which the software engineer can evaluate the programming languages of today.

The basic procedural abstraction primitives provided in programming languages are procedures and functions. Procedures can be thought of as extending of the statements of the language, while functions can be thought of as extending the operators of the language. A procedure call looks like a distinct statement, whereas a function call appears as or within an expression.

The power of procedural abstraction is that it allows the programmer to consider the method as an independent entity performing a well-described task largely independent of the rest of the program. When a procedure is called, it achieves its effect by modifying the data in the program which called it. Ideally, this effect is communicated to the calling program unit in a controlled fashion by the modification of the parameters passed to the procedure. Functions, like their mathematical counterparts, return only a single value and must therefore be embedded within expressions

1. *Read the text again and find the following:*

1) the preferred language of the information systems community;

2) the language for developing real-time or embedded computer systems

3) the language of the scientists and engineers;

4) the language of the systems programmers;

5) low-level languages;

6) high-level languages.

1. *In pairs discuss:*

1) the use of low-level languages;

2) the use of high-level languages;

3) the programming languages you have already used, their advantages and disadvantages.

*5. Match the words (1 – 7) with the words (a – h) to make technical terms and translate them into Ukrainian.*

1) software a) programmer

2) general purpose b) primitive

3) systems c) counterparts

4) high-level d) abstraction

5) built-in f) language

6) procedural g) assembler

7) mathematical h) engineer

*6. Make sentences using the collocations above.*

*GRAMMAR: PAST CONTINUOUS VS. PAST PERFECT CONTINUOUS*

We use *past continuous* to speak about an action in progress in a definite period in the past (*e.g. He phoned while we* ***were having*** *dinner)*

With *past perfect continuous* we say that something had been happening for a period of time before something else happened.

We form *past perfect continuous with* ***had been+ present participle***

*(e.g. I* ***had been writing programs*** *for six month before they unexpectedly fired me.*

*We* ***had been playing*** *tennis for half an hour before it started raining)*

*7. Put the verbs in brackets into either past continuous or past perfect continuous.*

1. I (write) programs in *C* for commercial use until they proposed me to work in a team.

2. He \_\_\_\_\_\_(work) for this company since May.

3. The research group\_\_\_\_\_\_\_(work) on the project when we arrived.

4. We \_\_\_\_\_\_\_(discuss) important issues at the meeting for 2 hours.

5. At 2 o’clock yesterday they were busy – they\_\_\_\_\_\_\_ (sign) an important contract.

6. How long \_\_\_\_\_\_\_\_(carry out) this experiment when they stopped to support your research.

*WRITING*

*Your friend has difficulties in writing Java applications. Write an e-mail, explaining to your friend the peculiarities of this language.*

**UNIT 4. COMPUTER NETWORKS AND THE INTERNET**

**4.1. Computer networks**

**4.2. Network topology**

**4.3. What are the Internet and the World Wide Web?**

**4.4. Internet and Web-based application architecture**

**4.5. Neural networks**

**4.1. COMPUTER NETWORKS**

*SPEAKING AND VOCABULARY: NETWORKS*

*1. Continue the following sentences (1 – 8), choosing their correct endings (a – h).*

1. Public wireless networks give Internet access to individuals

2. Private networks implementation requires

3. Small office networks give opportunities to workers

4. Wide area network can describe

5. Communication between geographically allocated sites

6. Computer networks provide

a) to access the Internet and company records, communicate with other employees, and share a high-speed printer.

b) any network available at the distance of more than one kilometer.

c) via their portable computers and mobile devices.

d) a communication capability which is common for computer systems and users.

e) is possible within the LANs and the WAN.

f) the organizations’ own or leased network lines or telephone lines.

*2. Read the text and answer the following questions:*

1. What types are networks classified into?

2. How can you implement a home network?

3. What are small office and school networks used for?

4. What are the functions of a router?

5. How can private networks be implemented?

6. What are the benefits and limitations of wireless networks?

**COMPUTER NETWORKS**

A *computer network* is a set of transmission lines, specialized hardware, and communication protocols that provide communication for different computer users and systems. For instance, home networks are commonly used to allow home computers to share a single printer and Internet connection, as well as to exchange files. Small office networks give opportunities to workers to access company information stored on its network server, communicate with other employees, share a high-speed printer, and access the Internet. School networks allow students and teachers to access the Internet and school resources, and large corporate networks often connect all of the offices or retail stores in the corporation, creating a network, covering several states or cities. Public wireless networks available at some coffeehouses, restaurants, public libraries, and parks provide Internet access to individuals via their portable computers and mobile devices; mobile telephone networks provide Internet access and communications capabilities to smartphone users.

Computer networks are divided into two types depending on the distance they cover. A *local area network**(LAN)* is typically less than one kilometer and connects computers within a single building or floor. The term *wide area network (WAN)* can refer to any network over one kilometer, though the term typically implies much greater distances covering continents, countries, cities and even the entire globe.

A single LAN spans each geographic location, and all of them are connected by a WAN. Users and computers in a single location communicate via a LAN. Communication between geographically allocated sites is possible within the LANs and the WAN. Each LAN is connected to the WAN by a router. When messages are addressed to a user or computer on another LAN they are scanned and copied by a router to the WAN. Messages are also scanned by a router on the WAN and copied into the LAN if they are addressed to a local user or computer.

To implement LANs such technologies as *Ethernet* are typically used. Their message-carrying capacity is in the range from low to moderate and the cost is relatively low. More complex and expensive WAN technologies e.g. asynchronous transmission mode provides higher message-carrying capacity and increasing reliability. WANs may be designed with the use of purchased equipment and leased long-distance transmission lines. WANs implementation and operation could also be possible from a long-distance telecommunications vendor.

Computer networks provide a communication capability which is common for computer systems and users. This generic capability supports a lot of services, including direct communications (phone calls and video conferencing), message-based communications (e-mail), and resource sharing (access to electronic documents, application programs, and databases). A single network can simultaneously support multiple services with appropriate hardware and sufficient transmission capacity.

An *intranet*is a private network that uses Internet protocols but is accessible only by a limited set of internal users (usually members of the same organization or workgroup). The term can also refer to a set of privately accessible resources that are organized and delivered via one or more Web protocols over a network, supporting TCP/IP. In spite that an intranet uses the same protocols as the Internet and Web, it restricts resource access to a limited set of users. Access can be restricted in a number of ways, such as firewalls, unadvertised resource names and user or group account names and passwords.

An *extranet* is an intranet that is extended to include directly related business users outside the organization (such as suppliers, large customers, and strategic partners). An extranet allows separate organizations to share information resources and coordinate their activities, thus forming a virtual organization. A virtual private network (VPN) is one of the most widely used methods of implementing an extranet. VPN is a secure network, accessible only to members of a certain organization or virtual one. Private networks implementation requires the organizations’ own or leased network lines or telephone lines. Encrypted messages within a VPN are sent through public Internet service providers.

*3. Match the following definitions with the terms in the text.*

1) a set of transmission lines, specialized hardware, and communication protocols;

2) a secure private network that is accessible only to the organization’s members;

3) a private network that is accessible only to a limited number of internal users;

4) technology which is used to implement LAN;

5) a device that scans messages on the WAN and copies them to the LAN;

6) an extended intranet which is used outside the organization by the directly related business users.

*4. In pairs discuss:*

1) what networks are better: wired or wireless;

2) what are the advantages of different types of networks?

3) your predictions of the future of communication networks.

*5. Make technical terms, matching the words (1 – 6) with the words (a – f) and translate them into Ukrainian.*

1) communication a) networks

2) high-speed b) messages

3) wireless c) protocols

4) transmission d) sharing

5) encrypted e) mode

6) resource f) printer

*GRAMMER: PASSIVE VOICE*

The passive voice is formed with the verb ***to be*** in the appropriate tense + the ***past participle*** of the main verb. We often prefer the passive when it is not important who or what did the action. If you want to say who did or what caused the action, use ***by***.

We often use the passive voice in technical writing to express an objectiveness of the information.

* Present simple passive

*Computer networks* ***are classified*** *into two types*.

* Past simple passive

*A hacker* ***was accused*** *of virus spreading.*

* Future simple passive

*Innovative capabilities* ***will be incorporated*** *into these systems.*

* Present continuous

*Nanotechnology* ***is being developed*** *to provide solutions for different research areas*.

* Past continuous

*My laptop* ***was being fixed****, so I had to use my PC*.

* Present perfect

*Initial research* ***has been funded*** *by the government.*

Past perfect

*Confidential information* ***had been stolen***.

Perfect continuous tenses are not used in the Passive.

1. *Write these sentences in the correct passive form*

1. Home networks *(use)* commonly to allow home computers to share a single printer and Internet connection, as well as to exchange files.

2. My laptop *(fix)*, so I had to use my PC.

3. The early generation of computers *(use)* primarily to do mathematical and scientific calculations.

4. WANs may *(construct)* with the use of purchased equipment and leased long-distance transmission lines.

5. Private network resources *(organize)* and *(deliver)* through one and more Web protocols via a network.

6. Access can *(restrict)* in various ways.

7. An extranet *(extend)* to share directly related business resources outside the organization.

8.Biometric fingerprint devices now *(to embed)* in such components as a computer mouse, computer keyboard, and small touch pads.

1. *Read the text and find all the examples of the passive voice. What tenses are they?*

The name of the individual or organization is typically reflected by the domain name and the different parts of a domain name are separated by a period. The far right part of the domain name (which begins with the rightmost period) is called the top-level domain (TLD) and traditionally identifies the type of organization or its location. The part of the domain name that precedes the TLD is called the second-level domain name and typically reflects the name of a company or an organization, a product, or an individual. There were seven original TLDs used in the United States; additional TLDs and numerous two-letter country code TLDs since then have been created. A great amount of domain names are registered throughout the world.

1. *Convert these sentences from active voice into the passive.*
2. Large corporate networks often connect all of the offices or retail stores in the corporation, creating a network that covers cities or states.
3. Public wireless networks provide Internet access to individuals via their portable computers and mobile devices.
4. The term *wide area network (WAN)* can describe any network over one kilometer.
5. A router scans messages on the LAN and copies them to the WAN.
6. A single network can simultaneously provide different services with appropriate hardware and sufficient transmission capacity.
7. A VPN sends encrypted messages through public Internet service providers.

*WRITING*

*You are having problems with the internet connection. Write an e-mail to your Internet Service Provider to complain and ask the company to help you in solving the problem.*

**4.2. NETWORK TOPOLOGY**

*SPEAKING AND VOCABULARY: NETWORK TOPOLOGY*

*1. Complete these sentences with the words given below.*

1. Many network standards dictate the type of *\_\_\_\_\_\_\_\_\_\_\_* which is used, while others are more versatile.

2. Perhaps the simplest type of *\_\_\_\_\_\_\_\_\_\_\_* is the one where there is only one transmitter, and all the other nodes are merely receivers.

3. When we have multiple transmitting *\_\_\_\_\_\_\_\_\_\_\_\_*, we have to order the transmissions in such a way that they don't interrupt each other.

4. To achieve maximum benefit multiple protocols may be *\_\_\_\_\_\_\_\_\_\_\_* together over different segments of a heterogeneous network.

5. *\_\_\_\_\_\_\_\_\_\_* is commonly implemented in a "bus" topology but can also be suitable for a "star" or "ring" topology with appropriate interconnecting equipment.

6. Token-passing protocol is mostly *\_\_\_\_\_\_\_\_\_\_\_\_*with ring-topology but in particular it is not restricted to any type of topology.

*joined, topology, Ethernet, protocol, nodes, associated*

*2. Read the text and answer the following questions:*

1. What are the main types of network topology?

2. What are the distinguishing features of each type of network topology?

3. What are different protocols used for?

**NETWORK TOPOLOGY**

"*Point-to-point*" topology is used to connect two digital devices within a network. The network wiring can be referred to a single line between two devices. For this purpose a twisted pair of wires, a coaxial cable, an optical fibre, or even a seven-conductor Bogus Bus can be used. Thus, the "shape" of a network is technically known as its topology.

If there are more devices or nodes on the network, we can talk about different types of network configuration such as *bus topology, star topology or ring topology.*

*Bus topology* is thesimplest one for installation and maintenance. Nodes can be easily added or removed with minimal wiring changes. On the other hand, one bus network must handle all communication signals from all nodes. This is known as broadcast networking, and is analogous to a group of people talking to each other over a single telephone connection, where only one person can talk at a time (limiting data exchange rates), and everyone can hear other people when they are talking (it concerns data security issue). Though, a fault in the bus wiring causes isolation of nodes into groups.

*Star topology.* At branching points in the network such devices as "gateways" can restrict data flow between nodes, allowing private communication between specific groups of nodes. This concerns the issues of the speed and security in the simple bus topology. However, those branches could easily be deleted from the rest of the "star" network if one of the gateways were to fail. Such a switched network is similar to the standard telephone system.

*Ring topology.* This kind of topology provides the highest degree of reliability with the least amount of wiring. Since each node has two connection points to the ring, a single break in any part of the ring doesn't affect the integrity of the network. The devices, however, must be designed with this topology in mind. Also, the network must be interrupted to install or remove nodes. As with bus topology, ring networks are broadcast by nature.

To achieve the best result, two or more ring topologies may be combined for specific purpose. This is often, true for industrial networks. Engineers and technicians joint multiple networks together in order to share wide information resources.

In addition to the issue of the physical network structure (signal types and voltage levels, connector pinouts, cabling, topology, etc.), there must be a standardized way in which communication can be provided between multiple nodes in a network, even in a simple two-node, point-to-point system.

When a node “talks” on the network, a signal is generating on the network wiring. Nodes that "listen" are simply measuring that applied signal on the network (from the transmitting node) and passively monitoring it. If two or more nodes "talk" at the same time, however, their output signals may clash (imagine two logic gates trying to apply opposite signal voltages to a single line on a bus!), corrupting the transmitted data. The standardized method by which nodes are allowed to transmit to the bus or network wiring is called a protocol. There are many different protocols for providing the use of a common network among multiple nodes.

Different protocols may use the same physical layer standard. An example of this is the RS-422A and RS-485 protocols, both of which use the same differential-voltage transmitter and receiver circuitry, using the same voltage levels to denote binary 1's and 0's. On a physical level, these two communication protocols are identical. However, on a more abstract level the protocols are different: RS-422A is point-to-point only, while RS-485 supports a bus topology "multidrop" with up to 32 addressable nodes.

*3. Match the words (1 – 5) with their definitions (a – e).*

1) topology a) electrical channel

2) node b) the layout or shape of a network

3) gateway c) a set of rules

4) protocol d) any computer device in a network

5) bus e) a piece of networking hardware

*4.Continue the following sentences (1 – 6), choosing their correct endings (a – f).*

1. Nodes can be easily added or removed

2. There are many different protocols for

3.Ring topology provides the best reliability

4. A fault in the bus wiring causes

5. Different protocols may use

6. Two or more ring topologies may be combined

a) with the least amount of wiring.

b) arbitrating the use of a common network between multiple nodes.

c) isolation of nodes into groups.

d) with minimal wiring changes.

e) for specific purpose.

f) the same physical layer standard.

1. *Work in small groups – A, B and C. Student A makes a diagram of bus topology, student B – star topology, student C – ring topology. Discuss advantages and disadvantages associated with each type of topology.*

*GRAMMAR: MODALS WITH PASSIVE INFINITIVE*

Modals ***must, should, have to, can, could, ma*y, *might*** are often followed by passive infinitive (be + past participle):

1. When we are talking about possibilities in the past:

*Security controls* ***may / might / could******have been implemented*** *to prevent unauthorized access.*

1. When we are talking about impossibilities in the past:

*The research* ***couldn’t have been completed*** *without a series of experiments.*

1. When we are talking about probabilities in the past:

*The initial research* ***must have been conducted*** *by the independent agency.*

1. When we are expressing regrets or criticisms about the past:

*This method* ***ought to have been applied*** *to improve the performance of the system.*

1. When we are making recommendations for the future:

*Both protocols* ***should be used*** *simultaneously to provide the best result.*

1. When we are talking about necessity:

*The job* ***had to be finished*** *yesterday.*

*1. Translate the following sentences paying attention to the modals with passive infinitive.*

1. Nodes *can be* easily *added* or *removed* with minimal wiring changes.

2. Data flow between nodes *can be restricted* at branching points in the network by such devices as "gateways".

3. Those branches *could* easily *be deleted* from the rest of the "star" network if one of the gateways were to fail.

4. New device *must be designed* on the basis of the previous one.

5. The concept *must be interpreted* according to several approaches.

6. Two or more ring topologies *may be combined* to achieve the best result in a particular application.

*2. Chose the correct form of the infinitive.*

1. Data transmission could *delay / be delayed* depending on a speed of transfer protocol.

2. A modern alternative to sending digital information via electric voltage signals is to *use / be used* optical signals.

3. Light signals can *convert / be converted* back into electrical signals through the use of photodiodes or phototransistors.

4. Digital information may optically *transmit / be transmitted* in open air, simply by aiming a laser at a photodetector at a remote distance.

5. One of the ways to overcome the problems of data transmission in open air is to *send / be sent* the light pulses down an ultra-pure glass fibre.

6. All data bits have to *appear /to be appeared* on the single channel in sequence.

7. Inductive and capacitive effects can *hold / be held* to a minimum.

*WRITING*

*You are having problems with a modem router. Write an e-mail to your friend who is a computer operator and ask him to help you in solving the problem.*

**4.3. THE INTERNET AND THE WORLD WIDE WEB**

*SPEAKING AND VOCABULARY: THE INTERNET AND THE WWW*

*1. Match the following definitions with the terms in the text*

1) a company that provides Internet access;

2) Web site;

3) Internet address;

4) formatted and linked document protocols;

5) program standards;

6) distributed software and Web-service standards.

*2. Read the text and answer the following questions:*

1. How can you define the Internet and the Web?

2. What way do the users connect to the Internet?

3. What does ISP stand for?

4. What are the most common types of Internet addresses?

5. What is the function of the domain names?

6. What can you use the Web resources for?

**WHAT ARE THE INTERNET AND THE WORLD WIDE WEB?**

The *Internet* is a global collection of networks that are interconnected with each other on the basis of a common networking standard called TCP/IP (Transmission Control Protocol/Internet Protocol).

The Internet is the largest and most well-known computer network in the world. It is technically a network of networks, which consists of thousands of networks that are connected with each other via the main backbone infrastructure of the Internet. Individual users access the Internet by connecting their computers or other devices to servers belonging to an Internet service provider (ISP) – a company that provides Internet access, usually for a fee. ISPs (which include conventional and mobile telephone companies) and stand-alone ISPs function as gateways to the Internet, providing Internet access to their subscribers. ISP servers are continually connected to a larger network, called a regional network, which, in turn, is connected to one of the major high-speed networks within a country, called a backbone network. Backbone networks within a country are connected to each other and to backbone networks in other countries. Together they form one enormous network of networks – the Internet.

To access a local computer network (such as a home network, a school or a company network, a public wireless hotspot), a network adapter (either built into your computer or attached to it) is required to connect your computer to the network. With some computer networks you need to supply logon information (such as a username and a password) to log on to a network.

Being connected to the Internet, you can access network resources, including the global network. If you are connecting to the Internet without going through a computer network, your computer needs to use a modem to connect to the communications media (such as a telephone line, cable connection, or wireless signal) used by your ISP to deliver Internet content.

To request a Web page or other resource located on the Internet, a unique numeric or text-based combination is used (Internet address). The most common types of Internet addresses are IP addresses and domain names (to identify computers), URLs (to identify Web pages), and e-mail addresses (to identify people).

IP addresses and their corresponding domain names are used to identify computers available through the Internet. IP (short for Internet Protocol) addresses are numeric, such as 207.46.197.32, and are commonly used by computers to refer to other computers. A computer that hosts information available through the Internet (such as a Web server hosting Web pages) usually has a unique text-based domain name (such as microsoft.com) that corresponds to that computer’s IP address in order to make it easier for people to request Web pages located on that computer. IP addresses and domain names are unique; that is, there cannot be two computers on the Internet using exactly the same IP address or the same domain name.

The *World Wide Web (WWW)* or simply the Web, is a collection of resources (programs, files, and services) that can be accessed over the Internet by a number of standard protocols, including the following:

• Formatted and linked document protocols, such as Hypertext Markup Language (HTML), eXtensible Markup Language (XML), and Hypertext Transfer Protocol (HTTP)

• Executable program standards, including Java, JavaScript, and Visual Basic Script (VBScript)

• Distributed software and Web-service standards, including Common Object Request Broker Architecture (CORBA), Simple Object Access Protocol (SOAP), and Java 2 Web Services (J2WS)

The Internet is the infrastructure on which the Web is based. That is, resources of the Web are accessible to users by means of the Internet.

While the term Internet refers to the physical structure of that network, the World Wide Web refers to one resource – a collection of documents called Web pages – available through the Internet. A group of Web pages belonging to one individual or company is called a Web site. Web pages are stored on computers (called Web servers) that are continually connected to the Internet; they can be accessed at any time by anyone with a computer (or other Web-enabled device) and an Internet connection. A wide variety of information is available via Web pages, such as company and product information, government forms and publications, maps, telephone directories, news, weather forecast, sports results, airline schedules etc. You can also use Web pages to shop, bank, trade stock, and perform other types of online financial transactions; access social networks like Facebook and MySpace; and listen to music, play games, watch shows, and perform other entertainment-oriented activities. Web pages are viewed using a Web browser, such as Internet Explorer (IE), Chrome, Safari, Opera, or Firefox.

*3. Make technical terms, matching the words (1 – 7) with the words (a – g) and translate them into Ukrainian.*

1)backbone a) names

2) wireless b) address

3) network c) information

4) logon d) adapter

5) domain e) hotspot

6) standard f) infrastructure

7) text-based g) protocols

*4. Correct the technical mistakes in the following sentences.*

1. The *Internet* is a global collection of networks that are interconnected with each other on the basis of a unique networking standard called TCP/IP.

2. IP addresses and their corresponding domain names are used to access computers available through the Internet.

3. The Web can be accessed over the Internet by a number of unique protocols.

4. ISP servers are temporarily connected to a larger network, called a regional network.

*5. Complete these statements using information from the text.*

1. Users connect to the Internet \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.

2. ISP and stand-alone ISPs function as \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.

3. Backbone networks within a country are connected to\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.

4. To access a local computer network, you need\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.

5. If you are connecting to the Internet without going through a computer network you\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.

6. The most common types of Internet addresses are\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.

7.There cannot be two computers on the Internet using the exact same\_\_\_\_\_\_\_.

*6. Read the text about different types of electronic commerce and match the headings with each of the paragraphs (1 – 3).*

1. Business-to-Business Applications

2. Business-to-Consumer Commerce

3. Internal Business Processes

*Electronic commerce*

1. In this form of electronic commerce, business must develop attractive electronic marketplaces to entice and sell products and services to consumers. For, example, companies may offer multimedia Web sites that provide virtual storefronts and virtual shopping malls, interactive order processing and secure electronic payment systems.

2. This category of electronic commerce involves both electronic business marketplaces and direct market links between businesses. Many companies offer the business community a variety of marketing and product information on the World Wide Web. Others also relay on electronic data interchange via the Internet for direct computer-to-computer exchange of business transaction documents with their business customers and suppliers.

3. All business functions and many business processes are affected by electronic commerce activities. Many internetworked enterprises are customer-driven and market-driven. They continually monitor and evaluate online information about their customers, suppliers and competitors from their Web sites and discussion groups. This information is available via intranets to all business functions and is used to shape a company’s product development, marketing programs, customer service and competitive strategies.

*GRAMMAR: PARTICIPLE*

The *Participle* is a non-finite form which has certain verbal and adjectival or adverbial features. The *Present Participle* ends in ***–ing*** and it is active in meaning. A sentence or a clause can be replaced by the *Present Participle*, when two actions take place simultaneously or one action follows immediately after another.

*The Internet is a global network. It connects other networks.*

*The Internet is a global network,* ***connecting*** *other networks.*

The *Past Participle* ends in *–ed* and it is passive in meaning. Relative clauses with passive verbs can be replaced by *Past Participle*.

*She has designed a web-site. It is dedicated to performance art.*

*She has designed a web-site,* ***dedicated*** *to performance art*.

Participle phrases are often used in technical texts to make the information more concise.

*1. Choose the correct form of participle.*

1. To access a local computer network, you need to use a network adapter either *building / built* into your computer or *attaching / attached* to it.

2.You can access network resources, *including / included* the network’s Internet connection.

3. A unique text-based domain name corresponds to the computer’s IP address in order to make it easier for people to request Web pages *locating / located* on that computer.

4*.* A group of Web pages *belonging / belonged* to a person or a company is called a Web site.

5. Web pages can be viewed *using / used* a Web browser.

6. Bookmarks can be used to redisplay a previously *visiting / visited* Web page and sites can be used to locate Web pages *matching / matched* specified criteria.

7. Computers and devices *basing / based* on related technology have become indispensable tools for modern life, *making / made* ordinary tasks easier and quicker than ever before and *helping / helped* make today’s worker more productive than ever before.

*2. Combine two sentences with a participle.*

1. a) Emoticons are illustrations of faces.

b) They show smiles, frowns, and other expressions.

2. a) They are created with keyboard symbols.

b)They allow people to add an emotional tone to written online communications.

3. a) People may use multiple identities to try to manipulate stock prices.

b) They post false information about a company to drive the price down.

4. a) The goal was to develop more sophisticated method.

b) It was needed to conduct further research.

5. a) Applet is a small Java application

b) It was designed to enable users to run automatically on the Web.

6. a) These links are called hyperlinks.

b) They allow you to view quickly different documents.

7. a) Hyperlinked documents are contained on certain Internet locations.

b) They are called Web sites.

*WRITING*

*You often buy things on Internet auction sites. Your friend has never bought online. Write him a letter and provide him with necessary information about online steps of buying and its precautions.*

**4.4. INTERNET AND WEB-BASED APPLICATION ARCHITECTURE**

*SPEAKING AND VOCABULARY: WEB-BASED APPLICATION ARCHITECTURE*

*1. Continue the following sentences (1 – 6), choosing their correct endings (a – f).*

1. Clients are special programs that

2. Web-like capabilities can be

3. Custom software and private access via modems require

4. Internet protocols do not guarantee

5. The data transfer capacity of many home users

6. Intranets, extranets, and the Web represent

a) more sophisticated development and maintenance of a greater amount of customized resources.

b)the logical evolution of client/server computing into an off-the-shelf technology.

c) send requests to servers using one or more of the standard Web resource request protocols.

d) built in common application programs.

e) is limited by analog modems to under 56 kilobits per second.

f) a minimum level of network throughput.

*2. Read the text and answer the following questions:*

1. What examples of client/server architecture can you think of?

2. What functions do the *clients* and Web protocols perform?

3. What are the advantages of implementing the applications via the Web, intranet and extranet?

4. What are the drawbacks of application delivery over the Internet and Web-based technologies?

**INTERNET AND WEB-BASED APPLICATION ARCHITECTURE**

The Web is a complex example of client/server architecture. Web resources are managed by processes of the server that can operate on dedicated server computers or on multipurpose computer systems. *Clients* are programs that send requests to servers using one or more of the standard Web resource request protocols. Web protocols define valid resource formats and a standard means of requesting resources and services. Any program, but not a Web browser, can use Web protocols. Thus, Web-like capabilities can be built in common application programs.

Internet and Web technologies present an attractive alternative for implementing information systems. One way of providing these capabilities would be to design custom application software and a private network which can be connected to the software.

Another alternative for implementing remote access for buyers would be to construct an application that uses a Web browser interface. The application would execute on a Web server, communicate with a Web browser using HTML or XML, and be accessible from any computer with an Internet connection. Buyers could use a Web browser on their laptop computer and connect to the application via a local Internet service provider. Buyers could also access the application from any other computer with Internet access (for example, a computer in a vendor’s office, hotel business suite, or copy center).

With Internet technology, client software can be updated simply by updating the version stored on the Web server. The application is relatively cheap to develop and deploy because existing Web standards and networking resources are employed. Custom software and private access via modems require more sophisticated development and maintenance of a greater amount of customized resources.

Implementing an application via the Web, an intranet, or an extranet has a number of *advantages* over traditional client/server applications, including the following:

• *Accessibility*. Web browsers and Internet connections are nearly ubiquitous. Internet, intranet, and extranet applications are accessible to a large number of potential users (including customers, suppliers, and off-site employees).

• *Low-cost communication*. The high-capacity WANs that form the Internet backbone were funded primarily by governments. Traffic on the backbone networks travels free of charge to the user, at least for the present. Connections between private LANs and the Internet can be purchased from a variety of private Internet service providers at relatively low cost. Thus, a company can use the Internet as a low-cost WAN.

• *Widely implemented standards*. Web standards are well known and many computing professionals are already trained in their use. Server, client, and application development software is widely available and relatively cheap. Information resource delivery via an intranet or extranet has all of the advantages of Web delivery because they use Web standards. In many ways, intranets, extranets, and the Web represent the logical evolution of client/server computing into an off-the-shelf technology.

Of course, there are *negative aspects* of application delivery via the Internet and Web technologies, including the following:

• *Security*. Web servers are a well-defined target for security breaches because Web standards are open and widely known. Wide-scale interconnection of networks and the use of Internet and Web standards make servers accessible to a global pool of hackers.

• *Reliability*. Internet protocols do not guarantee a minimum level of network throughputor even that a message will be received by its intended recipient. Standards have been proposed to address these shortcomings, but they have yet to be widely adopted.

• *Throughput*. The data transfer capacity of many home users is limited by analog modems to under 56 kilobits per second. Internet service providers and backbone WANs can become overloaded during high-traffic periods, resulting in slow response time for all users and long delays when accessing large resources.

• *Volatile standards*. Web standards change rapidly. Client software is updated every few months. Developers of widely used applications are faced with a dilemma: Use the latest standards to increase functionality or use older standards to ensure greater compatibility with older user software.

*3. Make technical terms, matching the words (1 – 7) with the words (a – g) and translate them into Ukrainian.*

1) multipurpose a) capacity

2) client/server b) throughput

3)customized c) technology

4)off-the-shelf d) architecture

5)data transfer e) target

6)well-defined f) periods

7)network g) computer systems

8)high-traffic h) resources

*4. Read the text and fill in the blank spaces with the words and expressions given below.*

*E-mail features*

Internet e-mail works essentially the same as e-mail\_\_\_\_\_\_\_\_– messages can be created, sent, forwarded, stored, printed, and deleted. To receive e-mail\_\_\_\_\_\_\_\_, you must have a mailbox, which is a file used to collect your messages \_\_\_\_\_\_\_. Although your mailbox can be located anywhere \_\_\_\_\_\_\_\_, it usually is located on the computer that connects you to the Internet, such as the server operated\_\_\_\_\_\_\_\_. Most ISPs and online services provide an Internet e-mail program and a mailbox as a standard part of their Internet access services.

An Internet mailbox address is a combination of a user name and the domain name that identifies the location of the mailbox computer. Your user name, or user-ID, is a unique combination of characters that identifies you. It must be different \_\_\_\_\_\_\_user names located on the same mailbox computer. A user name sometimes is limited to eight characters and \_\_\_\_\_is a combination of your first and last names, such as the initial of your first name plus your last name.

*over the Internet, from other, often, on the Internet, on other system, on an Internet computer, by your ISP.*

*GRAMMAR: PARTICIPLE, GERUND OR ADJECTIVE?*

***-ing*** forms are used as:

***Gerunds*** *(My job involves* ***editing***).

***Present Participles*** (*You can protect your data* ***installing*** *security alerts).*

***Adjectives*** (*With the use of multimedia your presentation will be more* ***interesting*)**.

The ***Gerund*** is a non-finite form of the verb combining the features of a verb and a noun. The ***Present Gerund*** refers to the present or future

*e.g. A CAD package involves solid* ***modeling, texturing and rendering****.*

The ***Perfect Gerund*** denotes the action which has happened before the action, expressed by the main verb.

*e.g. He regretted not* ***having discussed*** *this problem*.

*Gerund* is used after certain verbs (e.g. *anticipate, appreciate, avoid, finish, fancy, enjoy, hate, give up, involve, imagine, look forward to, keep, mind, suggest, prevent, stand,* etc.)

*1. Complete the following sentences with the words given below and decide if the –ing forms are gerund, participle or adjective.*

1*.* Web protocols determine resource formats and a standard means of \_\_\_\_\_\_ resources and services.

2. Internet and Web-based technologies represent an attractive alternative for\_\_\_\_\_\_\_\_ information system.

3.One way of \_\_\_\_\_\_\_\_these capabilities would be to design custom application software and a private network.

4. With Internet technology, client software can be updated simply by\_\_\_\_\_\_\_\_ the version stored on the Web server.

5. Web standards are well knownand many \_\_\_\_\_\_\_\_\_\_ professionals are already trained to use them.

6. Developed Web standards and \_\_\_\_\_\_\_\_\_resources are employed.

7. The search engine for \_\_\_\_\_\_\_\_\_ the items you want is quick and notifications are accurate and friendly.

*implementing, updating,* *finding, networking, providing, requesting, computing*

*2. Find the following phrasal verbs in the text above and then make your own sentences with them.*

to be free of charge, to purchase at relatively low cost, to be trained in something,to be faced with something, to ensure compatibility with something, to connect to something via something.

*WRITING*

*A friend of yours didn’t understand chat abbreviations you used while talking online. Write an email to your friend explaining to him the meanings of the most common used chat abbreviations.*

### 

### 4.5. NEURAL NETWORKS

*SPEAKING AND VOCABULARY:**NEURAL NETWORKS*

## *1. Continue the following sentences.*

## 1. The key element of an Artificial Neural Network paradigm is \_\_\_\_\_\_\_\_\_\_\_\_\_\_.

## 2. An ANN is built for a specific purpose, such as\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.

## 3. Many important developments in neural network simulations were promoted by the use of\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.

## 4. Currently a field of neural networks enjoys \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.

## 5. The first artificial neuron was produced \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.

## 6. Neural network is composed of\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.

## 7. Neural networks cannot be programmed to execute \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.

*2. Read the text and answer the following questions:*

1. What does an ANN stand for?

## 2. When did the developers begin to carry out the research on neural network simulations?

## 3. What are the periods of the development of the field?

## 4. What are neural networks used for?

## 5. What are the pros and cons of the field of neural networks?

### NEURAL NETWORKS

An Artificial Neural Network (ANN) is an information processing paradigm that works like biological nervous systems do, such as the brain processes information. The key element of this paradigm is the novel structure of the information processing system. It is composed of a large number of highly interconnected processing elements (neurones) working in unison to solve specific problems. ANNs, like people, learn by example. An ANN is configured for a specific application, such as pattern recognition or data classification, through a learning process. Learning in biological systems involves adjustments to the synaptic connections that exist between the neurones. This is true of ANNs as well.

### *Historical background*

Neural network simulations appear to be a recent development. However, this field was established before the advent of computers, and has survived at least one major setback and several eras. Many important advances were promoted by the use of inexpensive computer emulations. Following an initial period of enthusiasm, the field survived a period of frustration and disrepute. During this period when funding and professional support was minimal, important advances were made by relatively few researchers. Currently, the neural network field enjoys a resurgence of interest and a corresponding increase in funding. The first artificial neuron was produced in 1943 by the neurophysiologist Warren McCulloch and the logician Walter Pits. But the technology available at that time did not allow them to do too much.

Neural networks, with their remarkable ability to derive meaning from complicated or imprecise data, can be used to extract patterns and detect trends that are too complex to be noticed by either humans or other computer techniques. A trained neural network can be thought of as an "expert" in the category of information it has been given to analyse. This expert can then be used to provide projections to a given situation and answer *"what if"* questions.  
Other advantages include:

1. Adaptive learning: An ability to learn how to do tasks based on the data given for training or initial experience.
2. Self-Organisation: An ANN can create its own organisation or representation of the information it receives during learning time.
3. Real Time Operation: ANN computations may be carried out in parallel, and special hardware devices are being designed and manufactured which take advantage of this capability.
4. Fault Tolerance via Redundant Information Coding: Partial destruction of a network leads to the corresponding degradation of performance. However, some network capabilities may be retained even with major network damage.

### *Neural networks versus conventional computers*

Neural networks take a different approach to problem solving than that of conventional computers. Conventional computers use an algorithmic approach i.e. the computer follows a set of instructions in order to solve a problem. Unless the specific steps that the computer needs to follow are known the computer cannot solve the problem. That restricts the problem solving capability of conventional computers to problems that we already understand and know how to solve. But computers would be so much more useful if they could do things that we don't exactly know how to do.

Neural networks process information in a similar way the human brain does. They cannot be programmed to perform a specific task. The examples must be selected carefully otherwise useful time is wasted or even worse the network might be functioning incorrectly. The disadvantage is that because the network finds out how to solve the problem by itself, its operation can be unpredictable.

On the other hand, conventional computers use a cognitive approach to problem solving; the way the problem is solved must be known and stated in small unambiguous instructions. These instructions are then converted to a high level language program and then into machine code that the computer can understand. These machines are totally predictable; if anything goes wrong it is due to a software or hardware fault.

Neural networks and conventional algorithmic computers are not in competition but complement each other. There are tasks that are more suited to an algorithmic approach like arithmetic operations and tasks that are more suited to neural networks. Even more, a large number of tasks, require systems that use a combination of two approaches (normally a conventional computer is used to supervise the neural network) in order to perform at maximum efficiency.

Neural networks do not perform miracles. But if used sensibly they can produce some amazing results.

*3. Read the text again and find the following.*

1) highly interconnected processing elements;

2) property enabling a system to continue operating in a case of failure;

## 3) a group of highly interconnected nodes, exchanging information between each other;

4) following a set of instructions to solve the problem;

5) following a set of unambiguous instructions;

6) not open to more than one interpretation.

## *4. Word building*

*Decide whether the given words are nouns, verbs or adjectives. Complete the sentences with these words.*

## *process \_\_\_\_, processing \_\_\_\_\_\_, processor\_\_\_\_\_\_\_*

1. The operations a microprocessor performs are called the instruction set of this \_\_\_\_\_\_\_\_\_\_.

2. Neural networks \_\_\_\_\_\_\_\_\_ information in a similar way the human brain does.

3. It is composed of a large number of highly interconnected \_\_\_\_\_\_\_\_\_elements (neurones) working in unison.

## *structure(s) \_\_\_\_\_\_\_\_, structural \_\_\_\_\_\_\_\_, structured\_\_\_\_\_\_\_\_*

## 1. A typical neuron receives signals from other neurons through a host of fine *\_\_\_\_\_\_\_\_* called dendrites.

2. There are a number of *\_\_\_\_\_\_\_\_\_\_*elements that you can use.

3. \_\_\_\_\_\_\_\_\_ programming is a way of organizing and coding programs.

## *specific \_\_\_\_\_\_\_, specification\_\_\_\_\_\_\_\_\_, specify\_\_\_\_\_\_\_\_*

## 1. The weights \_\_\_\_\_\_\_\_\_the strength of the influence.

2. Unless the *\_\_\_\_\_\_\_\_\_* steps that the computer needs to follow are known the computer cannot solve the problem.

3. The focus on \_\_\_\_\_\_\_\_\_\_ should be on what is achieved, not how it is achieved.

#### 5. Read the text. Fill in the necessary prepositions, given below.

Much is still unknown \_\_\_\_\_how the brain trains itself to process information, so theories abound. \_\_\_\_\_\_ the human brain, a typical neuron collects signals \_\_\_\_\_ others \_\_\_\_\_ a host of fine structures called dendrites. The neuron sends \_\_\_\_\_ spikes of electrical activity **\_\_\_\_\_\_\_** a long, thin stand known as an axon*,* which splits \_\_\_\_\_ thousands \_\_\_\_\_ branches. \_\_\_\_ the end of each branch, a structure called a synapseconverts the activity \_\_\_\_ the axon \_\_\_\_\_electrical effects that inhibit or excite activity \_\_\_\_\_ the connected neurones. When a neuron receives excitatory input that is sufficiently large compared \_\_\_\_its inhibitory input, it sends a spike \_\_\_electrical activity\_\_\_\_ its axon. Learning occurs\_\_\_\_\_ changing the effectiveness of the synapses so that the influence of one neuron\_\_\_\_\_ another changes.

*from, about, by, out, in, with, through, into, on, in, of, through, of, down, into, at, from*

*GRAMMAR: CONDITIONAL SENTENCES*

There are four types of conditionals.

***Zero conditional***(*If + present simple / present simple or imperative*)we use to talk about actions which always happen under certain conditions.

***If*** *you* ***heat*** *water, it* ***boils****.*

***If*** *your computer* ***is hung***, *restart it*.

***First conditional*** (*If + present tenses / will (not*) is used to talk about possible actions in the present or future.

***If*** *you* ***use*** *this approach, the problem* ***will be solved***.

***Second conditional*** (*If + past simple (continuous) / would (not*) is used to talk about unreal situations in the present.

***If*** *you* ***applied for*** *this job, you* ***would get*** *it.*

***Third conditional*** (*If + past perfect / would + have + past participle*) is used to talk about unreal situations in the past or to express regret or criticism.

***If*** *they* ***had used*** *digital certificates, the hackers* ***wouldn’t have broken*** *into the banking system.*

*1. Open the brackets and complete these sentences using the correct form of the verb.*

1. If the examples *(not be selected)* carefully, the network will be functioning incorrectly.

2. If our knowledge of neurones were complete, our models of real networks of neurones *(be)* ideal.

3. A neural network will learn on-line if it *(learn)* and *(operate)* at the same time.

4. If they had replaced the worn-out details, the accident (*happen*).

5. An incident wouldn’t happen if they (follow) all the instructions.

6. If the computers *(appear)* intelligent, they would not really be.

7. The device performance will be better if its reliability *(increase).*

*2. Work in pairs. Discuss these questions.*

*What would you do if...*

1. you were an expert in the field of ANN?
2. you headed a research centre?
3. someone offered you a job?
4. you won a grant?
5. you had to give up your research?

*WRITING*

*Write you own predictions about the future of Artificial Neural Networks.*

**UNIT 5. MANAGING IT: SECURITY AND ETHICAL CHALANGES**

**5.1. Internet security**

**5.2. Integrity controls to prevent fraud**

**5.3. Security for access to systems**

**5. 4. Secure transactions**

**5.5. Information ethics**

**5.1. INTERNET SECURITY**

*SPEAKING AND VOCABULARY:* ***INTERNET SECURITY***

## *1. Continue the following sentences.*

1. New viruses are constantly \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.

2. Hackers can access email messages\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.

3. Key loggers track your keystrokes and \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.

4. Browsers keep records of\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.

5. Anyone with influence over your ISP may be able to\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.

*2. Read the text and answer these questions:*

1. Why can your e-mail be accessible to hackers?

2. In what ways are viruses spread?

3. How can you protect your computer and keep your information private?

4. How can key loggers systems be defeated?

**INTERNET SECURITY**

Your email is not transmitted directly from your computer to the intended recipient’s computer. It goes through several nodes and leaves behind information as it passes. **It can be accessed along all its path (not only in/from your country!)**

Someone could be looking overyour shoulder as you type. This is especially problematic in internet cafes. If you are connected to a network, your email may be accessible to everyone else in the office. Your system administrator may have special administrative privileges to access all emails.

Your internet service provider (ISP) has access to your emails, and anyone with influence over your ISP may be able to pressure it into forwarding them copies of all your emails or to stop certain emails from getting through.

As they pass through the internet, your emails flow through hundreds of insecure third-parties. Hackers can access email messages as they pass. The ISP of your intended recipient may also be vulnerable, along with the network and office of your intended recipient.

***Basic internet security***

Viruses and other problems, such as Trojan Horses or Trojans, can come from anywhere; even friends may unknowingly spread viruses. Use a good anti-virus program and keep up-to-date with automatic online updating. New viruses are constantly being created and discovered, they are usually spread through emails, so practice safe emailing. Viruses aresingle programs designed to replicate and may or may not be malignant. Trojans are programs designed to give a third party (or anyone!) access to your computer.

A good firewall can help you appear invisible to hackers and keep out intruders trying to get into your system. This ensures that only authorized applications can connect to the internet from your computer and prevents programs such as Trojans from sending out information or opening “back doors” to your computer through which hackers can enter.

A “key logger” system can track every keystroke you make. These programs are spread either by someone putting it onto your computer while you are away, or through a virus or Trojan that attacks your system over the internet. Key loggers track your keystrokes and report on your activities, usually over the internet. They can be defeated through passphraseprotecting your computer, practicing safe emailing, using an anti-virus program, and using a mouse-guided program to type in your passphrase. Key loggers can also be disabled by physically disconnecting your computer’s internet access – usually by simply unplugging the computer’s telephone connection – when you are not using the computer.

An email address can be “spoofed” (faked) or used by someone other than the true owner. This can be done by obtaining access to another person’s computer and password, by hacking into the service provider, or by using an address that appears to be the specific person’s address. For example, by exchanging the lowercase “l” with the number “1”, you can create a similar address and most people will not notice the difference. To avoid being fooled by a spoof, use meaningful subject lines and periodically ask questions that only the true person could answer. Confirm any suspicious requests for information by following it up through another form of communication.

Keep your browsing activity private by not accepting cookies and by deleting your cache after every time you use the web. In Internet Explorer, go to Tools, then Options. In Netscape Navigator, go to Edit, then Preferences. While you’re in either of these menus, delete all your history, any cookies you may have and empty your cache. Remember to delete all your bookmarks as well. Browsers also keep records of the site you visit in cache files, so find out which files should be deleted on your system.

Upgrade all web browsers to support 128-bit encryption. This will help safeguard any information you want to pass securely over the web, including passwords and other sensitive data submitted on forms. Install the most recent security patches for all software used, especially Microsoft Office, Microsoft Internet Explorer and Netscape.

Don’t use a computer with delicate information stored on it for non-essential web browsing.

*3. Read the text again and find the following.*

1) a person who uses technology for criminal aims;

2) malignant programs designed to replicate themselves;

3) programs designed to give a third party access to your computer;

4) a software or hardware device that allows limited access to an internal network;

5) a system that can track every keystroke you make;

6) a sequence of words used to control access to a computer system, program or data.

*4. Continue the following sentences (1 – 7), choosing their correct endings (a – g).*

1.Your email goes through several nodes and

2. Your system administrator may have

3. Use a good anti-virus program and

4. A good firewall can help you appear invisible to

5. “Key logger” systems are spread either by

6. To avoid being fooled by a spoof, use meaningful subject lines and

7. Keep your browsing activity private by

a) hackers and keep out intruders trying to get into your system.

b) special administrative privileges to access all emails.

c) periodically ask questions that only the true person could answer.

d) leaves behind information as it passes.

e) someone putting them onto your computer while you are away, or through a virus or Trojan.

f) not accepting cookies and by deleting your cache after every time you use the web.

g) keep up-to-date with automatic online updating.

5.*Read the text and complete it with the technical terms given below.*

*Data security*

The primary method of maintaining the security of data, both on internal systems and transmitted data is by encrypting the data. \_\_\_\_\_\_\_\_\_\_is the process of altering data so that unauthorized users cannot view it. \_\_\_\_\_\_\_\_\_\_\_is the process of converting encrypted data back to its original state. Data stored in files or a database on hard drives or other storage devices can be encrypted to protect it against theft. Data sent across a network can be encrypted to prevent eavesdropping or theft during transmission. A thief or eavesdropper who steals or intercepts encrypted data receives a meaningless group of bits that are difficult or impossible to convert back into the original data.

An  *\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_*is a complex mathematical transformation that encrypts or decrypts binary data. An encryption key is a binary input to the encryption algorithm—typically a long string of bits. The encryption algorithm varies the data transformation based on the \_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_so that data can be decrypted only with the same key or a compatible decryption key.

A significant problem with \_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_ is that both sender and receiver use the same key, which must be created and shared in a secure manner. Security is compromised if the key is transmitted over the same channel as messages encrypted with the key. Also, sharing a key among many users increases the possibility of key theft.

*\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_* uses different but compatible keys to encrypt and decrypt data. \_\_\_\_\_\_\_\_\_ *\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_* is a form of asymmetric key encryption that uses a public key for encryption and a private key for decryption. The two keys are like a matched pair. After information is encrypted with the public key, it can be decrypted only with the private key. It cannot be decrypted with the same public key that encrypted it. Organizations that use this technique broadcast their public key so that it is freely available to anybody who wants it.

Some asymmetric encryption methods can encrypt and decrypt messages in both directions. That is, in addition to encrypting a message with the public key that can be decrypted with the private key, an organization can also encrypt a message with the private key and decrypt it with the public key. Notice that both keys must still work as a pair, but the message can go forward or backward through the encryption/decryption pair. This second technique is the basis for \_\_\_\_\_\_ \_\_\_\_\_\_\_\_and certificates.

*Asymmetric key encryption, encryption, digital signatures, public key encryption, encryption key, symmetric key encryption, encryption algorithm, decryption*

*5. Complete the row*

*n adj v*

*encryption \_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_*

*\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_ to decrypt*

*\_\_\_\_\_\_\_\_\_ transmitted \_\_\_\_\_\_\_\_\_\_\_\_*

*security \_\_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_\_*

*\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_\_ to protect*

*conversion \_\_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_*

*\_\_\_\_\_\_\_\_\_ transformed \_\_\_\_\_\_\_\_\_\_\_\_*

*\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_\_ to protect*

*GRAMMER: UNLESS, PROVIDED/PROVIDING (THAT)*

These expressions mean ***but only if***. They are used in more formal or official contexts (contracts, letters of agreement, etc.), emphasizing condition for an action. We use a *present* tense when we are talking about a future action.

*You will not be able to create a web-page* ***unless*** *you learn HTML.*

*You can convert encrypted data into its original form* ***providing*** *you know a key.*

*1. Choose the correct word for each sentence.*

1. Your email may be accessible to everyone *unless/providing* you use a good anti-virus program.

2. Only authorized applications can connect to the internet from your computer *unless/providing* you install a good firewall.

3. An email address can be used by someone else *unless/providing* youuse meaningful passphrase and confirm any suspicious requests for information by following it up through another form of communication.

4. You will safeguard any information you want to pass securely over the web *unless/provided* all web browsers are upgraded to support 128-bit encryption.

5. Viruses are usually spread through emails *unless/provided* you practice safe emailing.

6.You can keep out intruders trying to get into your system *unless/providing* you set all security alerts.

7. Today, data is collected about practically anything we buy online or offline, although offline purchases may not be associated with our identity *unless/providing* we use a credit card or loyalty card.

*2. Translate the following phrasal verbs and then make you own sentences with them.*

Look over smb.’s shoulder, look at the message, look for the hacker, look through the journal; keep unauthorized users out, keep track of, keep the lights on, keep to the path.

*WRITING*

*Write a letter to the Internet Safety Foundation. Enlist a number of cybercrimes and a list of measures which should be taken by the government to stop cybercrimes.*

**5.2. INTEGRITY CONTROLS TO PREVENT FRAUD**

*SPEAKING AND VOCABULARY:**INTEGRITY CONTROLS*

*1. Continue the following sentences (1 – 5), choosing their correct endings (a – e).*

1*.* The objective of integrity controls is

2. The objective of security controls is

3. More and more organizations utilize the Internet as

4. Security controls use techniques to protect data

5. The most common security control points are

a) a portal to their customers and to their suppliers.

b) to protect the assets of an organization from all threats.

c) network and computer operating systems.

d) to reduce or eliminate the opportunity for fraud.

e) while it is in transit from the source to the destination.

*2. Read the text and answer these questions:*

1. Why should be integrated controls required in a system?

2. What are the main objectives of system controls?

3. How can integrity controls be implemented?

4. Why is the problem of computer fraud so important today?

**INTEGRITY CONTROLS TO PREVENT FRAUD**

Fraud is a problem that is reaching epidemic proportions in the United States and around the world. Almost every week we see newspaper articles describing fraud and other white-collar crimes. The economic losses caused by fraudulent activity around the world are staggering. These losses reach into the billions of dollars and far exceed those from violent and personal crimes. In the last few years, several major corporations have been forced into bankruptcy or closure due to the fraudulent behaviour of key executives. Obviously, software and system controls will not completely eliminate fraud. However, system developers should be aware of the fundamental elements that make fraud possible and incorporate system controls to combat it.

The objective of integrity controls is to reduce or eliminate the opportunity for fraud by having adequate manual controls and automated records of money and assets. Control of fraud requires both manual procedures and computer integrity controls. Neither component is sufficient by itself to reduce the opportunities for fraud. System developers need to work closely with business users who are knowledgeable about accounting principles to prevent fraud. Sometimes system developers might think that integrity controls are not necessary because the system in development is not a financial or accounting system. However, an opportunity for fraud exists in almost every business system. Because most business systems track an organization’s assets, someone could manipulate those assets, writing checks for incorrect amounts or to fictitious parties. Hence, almost every system requires some type of integrity controls.

Although the objective of security controls is to protect the assets of an organization from all threats, the primary focus is generally on external threats. Security controls also have the following two objectives:

• Maintain a stable, functioning operating environment for users and application systems (usually 24 hours a day, seven days a week).

• Protect information and transactions during transmission outside the organization (public carriers).

The first objective, to maintain a stable operating environment, focuses on security measures to protect the organization’s systems from external attacks, such as from hackers, viruses, worms, and message overloads. Most organizations today have gateways between their internal systems and the Internet. Every time someone in an organization sends a communication to or receives one from the Internet, there is the potential for a security violation and for undesirable access that could disrupt the internal systems. So, eliminating and controlling any undesirable access help to avoid disruption of the system. The second objective, to protect transactions during transmission, focuses on the information that is sent or received via the Internet. More and more organizations utilize the Internet as a portal to their customers and to their suppliers. After a transaction is sent outside the organization, it could be intercepted, destroyed, or modified. So, security controls use techniques to protect data while it is in transit from the source to the destination.

Security controls can be implemented within different types of software, including the network and computer operating system, the database management system, or the application programs.

The most common security control points are network and computer operating systems because they exercise direct control over assets such as files, application programs, and disk drives. All modern operating systems contain extensive security features that can identify users, restrict access to files and programs, and secure data transmission among distributed software components. Operating system security is the foundation of security for most information systems.

On some occasions, developers might implement security controls directly within application software. Developers can define their own security controls over individual data items or records when data is stored in files instead of a database. Developers can also implement security controls to prevent unauthorized users from performing certain functions such as deleting existing data or creating backup copies on removable storage media.

*3. Read the text again and find the following.*

1) providing the basic level of security in a system;

2) non-violent crime committed by business and governmental employees;

3) a deliberate deception for unfair or unlawful gain;

4) a major disturbance of a system;

5) to fight against, to oppose vigorously;

6) non-existent; purposely deceptive, false;

7) data which has been copied and archived in order to restore the original.

*4. Complete these sentences with the words given below.*

1*.* Control of fraud requires both manual \_\_\_\_\_\_\_\_\_and computer integrity controls.

2. System developers need to work closely with business users who are knowledgeable about \_\_\_\_\_\_\_\_\_\_\_principles to prevent fraud.

3. Most organizations today have \_\_\_\_\_\_\_\_\_\_\_between their internal systems and the Internet.

4. Eliminating and controlling any undesirable access help \_\_\_\_\_\_\_\_\_disruption of the system.

5. After a transaction is sent outside the organization, it could be \_\_\_\_\_\_\_\_\_\_\_, destroyed, or modified.

6. Operating system security is the \_\_\_\_\_\_\_\_\_\_\_of security for most information systems.

7. Security controls use techniques to protect data while it is in \_\_\_\_\_\_\_\_\_from the source to the destination.

*accounting, intercepted, to avoid, foundation, procedures, transit, gateways*

*GRAMMER:*

*MODALS: CAN, COULD; MAY, MIGHT; SHOULD, MUST*

Modal verbs are used to add extra meaning to the verb.

We use ***can*** to say that something is possible or that someone has the ability to do something. *(e.g. He* ***ca****n write programs in C).*

We use ***could*** in a number of ways. Sometimes it is the past of ***can*** (*e.g. The initial research was conducted, so we* ***could*** *solve a lot of problems*), but it also has a present or future meaning. Sometimes we use ***could*** making suggestions about future action (*e.g. When you go to the conference, you* ***could*** *stay at a hotel*)

We use ***could have done*** to say that we had the ability or opportunity to do something in the past but we did not do it. (*e.g. We* ***could have visited*** *him yesterday, but we decided to do it at the weekend*).

***May*** and ***might*** are used to say that something is possible in the present or in the future. They express weaker possibilities. (e.g. *They* ***may*** *be in the class-room* (perhaps they are in the class-room). *He* ***might be taking*** *an exam* (perhaps he is taking an exam). *The Internet* ***might*** *change a lot in the next ten years)*.

We use ***may have done, might have done*** to say that the action was possible in the past (*e.g. He* ***might have forgotten*** *about the conference* (perhaps he forgot).

When we are talking about possible plans we can also use a continuous form (*e.g. I* ***may (might) be working*** *in the evening* (it’s possible).

We use ***should*** when we advice to do something, ask for something or give an opinion. (*e.g. It’s an interesting film. You* ***should*** *see it. You* ***should*** *often update your anti-virus software*).

We use ***should have done*** for the past action to say that something was not a right thing (*e.g. You* ***should have finished*** *your job. Why didn’t you do it*?).

***Should*** is used to tell that something will probably happen (*e.g. I think he* ***should*** *fix a computer*).

We use ***must*** and ***have to*** say that it is necessary to do something. ***Must*** is used when we are talking about the present or future. ***Have to*** can be used in the present, past and future. (*e.g. The government* ***must*** *take measures to stop cybercrime. We* ***must*** *do this. We* ***have to*** *do this. We* ***had to*** *do this. We* ***will have to*** *do this*).

***Mustn’t*** and ***don’t have to*** are completely different (*e.g. You* ***mustn’t*** *be late (you must be on time). You* ***don’t have to*** *do this job (it is not necessary to do it*).

*1. Complete these sentences with suitable modal verbs.*

1. System developers *\_\_\_\_\_\_\_* consider different types of users when designing access controls.

2. On some occasions, developers *\_\_\_\_\_\_\_\_* implement security controls directly within application software.

3. Security controls *\_\_\_\_\_\_\_* be implemented within different types of software.

4. These mechanisms *\_\_\_\_\_\_\_* be used to control access to any resource managed by the operating system or network – including hardware, application programs, and data files.

5. Because most business systems track an organization’s assets, someone *\_\_\_\_\_\_\_* manipulate those assets, writing checks for incorrect amounts or to fictitious parties.

6. System developers *\_\_\_\_\_\_\_\_* beaware of the fundamental elements that make fraud possible and incorporate system controls to combat it.

7. Controls *\_\_\_\_\_\_* be able to identify and exclude access from these people.

8. The important point for systems designers to recognize is that there \_\_\_\_\_\_\_be multiple levels of registered users.

9. The security system **\_\_\_\_\_\_\_**be organized so that all resources can be accessed with the same unique identifier and password combination.

2. In pairs discuss things:

1) you should know to maintain a stable functioning of your operating system;

2) you can do to protect your data transmission;

3) you must consider when implementing security controls;

4) that might be developed in the field of Internet security.

*WRITING*

*Think of a job in a cyberpolice. What are the most important qualities and abilities for this job? Write a letter of application for it.*

**5.3. SECURITY FOR ACCESS TO SYSTEMS**

*SPEAKING AND VOCABULARY:* *SYSTEM ACCESS CONTROLS*

## *1. Continue the following sentences.*

1. An information system can use access control functions \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.

2. To begin development of access controls, designers first must identify and consider \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.

3. The different levels of access are defined during \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.

4.Privileged users include\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.

5. The user is authenticated if \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.

6. More sophisticated security systems can scan\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.

*2. Read the text and answer these questions:*

1. What is the function of system access controls?

2. What are the most common types of user categories?

3. What techniques are used to define passwords?

4. What is a new form of security based on?

**SECURITY FOR ACCESS TO SYSTEMS**

System access controls are mechanisms that are established to restrict what portions of the computer system a person can use. This category includes controls to limit access to certain applications or functions within an application, restrict access to the computer system itself, and limit access to certain pieces of data. With proper design and implementation, an information system can use access control functions embedded in system software.

Thus, the systems designer can implement a single access control scheme and apply it to every resource or information system. To begin development of access controls, designers first must identify and consider all three of these user categories: unauthorized users, registered users, and privileged users.

*Unauthorized users* are people who are not allowed access to any part or functions of the system. Such users include employees who are prohibited from accessing the system, former employees who no longer are permitted to access the system, and outsiders such as hackers and intruders. Controls must be able to identify and exclude access from these people.

*Registered users* are those who are authorized to access the system. Normally, various levels of registered users are set up depending on what they are authorized to view and update. The different levels of access are defined during the design of the new system. For example, some users might be allowed to view data but not update it, and other users can update only certain data fields. Some screens and functions of the new system might be hidden from other levels of registered users. The important point for systems designers to recognize is that there might be multiple levels of registered users.

*Authorization* is the process of determining whether a user is permitted to access a specific resource for a particular purpose. In other words, it is the process of deciding whether a user should be a registered user. The security system stores an access control list for each protected resource. An *access control list* is a list of users or user groups that can access a resource and the permitted access type(s).

*Privileged users* include people who have access to the source code, executable program and database structure of the system. These people include system programmers, application programmers, operators, and system administrators, and they might also have differing levels of security access. Usually, system programmers have full access to all components of the systems and data. Application programmers have access to the applications themselves but often not to the secure libraries and data files used for the systems in production. System administrators have access to all functions of the system and can control and establish the various levels of registration and register users. A system administrator also usually has software programs to help control access and to monitor access attempts.

*Authentication* is the process of identifying users (that is, the authorized or registered users) who request access to sensitive resources. The user is authenticated if the password he or she enters matches the password stored in the security database.

Two techniques are used to define passwords. The computer can randomly generate and assign passwords, or each user can define his or her own password. There are advantages to both techniques. The first creates passwords that are usually longer and more random, but they tend to be hard for users to remember. User-developed passwords are easier to remember, but they are usually not as complex and, therefore, not quite as secure. Some restrictions can be placed on the syntax of the password to ensure at least a minimum level of security.

Of course, one of the problems with passwords is remembering what they are. One alternative is to use the same password for all systems, but if someone determines the password, all the systems are compromised. Most often, the security system should be organized so that all resources can be accessed with the same unique identifier and password combination. In other words, only one user ID/password combination should be required for access to the different systems throughout the organization. When users have to remember different IDs and passwords to access different systems, they often write them down and post them near the computer. Obviously, this practice defeats the purpose of user verification security.

A *smart card* is a computer-readable plastic card with a small amount of stored security data that can be read by a card scanner in much the same way a credit or debit card can be read at a supermarket checkout counter. The smart card stores an encrypted version of the user’s password, fingerprint, retinal scan, or voice characteristics. To authenticate himself or herself, the user scans the card and then enters the password or submits to a fingerprint, retinal, or voice scan. Such a system enhances security because the user must possess both the card and the appropriate identifying information to be authenticated. Only the security sub-system knows the key, which prevents potential intruders from using cards with altered data. A final security step is to make sure the system keeps a record of attempted logons, especially unsuccessful ones. An unsuccessful logon might simply indicate that the user mistyped or forgot a password, but it might also indicate an attempted breach of security, which should be investigated.

*Biometric Devices*

Many companies are now experimenting with a new form of security based on *biometric devices*. The principle behind use of a biometric device is that the person himself becomes the password or gateway into a secure system. These more sophisticated security systems can scan fingerprints, retinal blood vessels, or voices, which are unique for every person. With the advent of very small computer chips with very high memory densities and logic circuitry, biometric devices can be built into almost any of the normal hardware components of a computer. In addition, the complex logic necessary to do sophisticated pattern matching of fingerprints, hand vein patterns, retinas, iris patterns, or complete facial patterns can be located right in the micro-sized biometric device itself.

Biometric fingerprint devices are now being embedded in such components as a computer mouse, computer keyboard, and small touch pads. Other biometric scanners, such as very small cameras, can be embedded in the computer monitor. Such a device might do an iris or facial scan of the person looking at the monitor.

Security based on biometric devices can also be multilevel. Security verification can be done when the user first tries to log on. Higher levels of security can later be activated within a given program to obtain additional authorization to access specific forms or database records.

*3. Read the text again and find the following.*

1) people who are not allowed access to any part or functions of the system;

2) the process of determining whether a user is permitted to access a specific resource for a particular purpose;

3) the process of identifying users who request access to sensitive resources;

4) people who are not allowed access to any part or functions of the system;

5) mechanisms that restrict what portions of the computer system a person can use;

6) people who are authorized to access the system.

*4. Read the text and complete it with the words and collocations given below.*

*The Anonymity Factor*

By their very nature, **\_\_\_\_\_\_\_ \_\_\_\_\_\_\_**lend themselves to anonymity. Since recipients usually do not hear senders’ voices or see their **\_\_\_\_\_\_\_**, it is difficult to know for sure who the sender is. Particularly on **\_\_\_\_\_\_ \_\_\_\_\_\_\_** (online discussions in which users post messages and respond to other posts), in virtual worlds, and other online activities where individuals use made-up names instead of real names, there is an **\_\_\_\_\_\_\_ \_\_\_\_\_\_\_** to being online.

Being anonymous gives many individuals a **\_\_\_\_\_\_ \_\_\_\_\_\_**, which makes them feel able to say or do anything online. This sense of speech true freedom can be **\_\_\_\_\_\_\_**. For example, a reserved individual who might never complain about a poor product or service in person may feel comfortable **\_\_\_\_\_\_ \_\_\_\_\_\_** by e-mail. In online discussions, many people feel they can be completely honest about what they think and can introduce new ideas and **\_\_\_\_\_\_\_ \_\_\_\_\_\_\_** without inhibition.

But, like all good things, online anonymity can be **\_\_\_\_\_\_**. Using the Internet as their shield, some people use rude comments, ridicule, profanity, and even **\_\_\_\_\_\_\_** to attack people, places, and things they do not like or **\_\_\_\_\_\_ \_\_\_\_**. Others may use multiple **\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_**(such as multiple usernames on a message board) to give the appearance of increased support for their points of view. Still others may use multiple identities to try to manipulate **\_\_\_\_\_\_ \_\_\_\_\_\_** (by posting false information about a company to drive the price down, for instance), to get buyers to trust an online **\_\_\_\_\_\_\_ \_\_\_\_\_\_\_** (by posting fictitious positive feed-back about themselves), or to commit other illegal or **\_\_\_\_\_\_\_ \_\_\_\_\_\_**.

*handwriting, online identities, abused, unethical acts, beneficial, anonymous feel, auction seller, points of view, online communications, lodging a complaint, stock prices, slander, sense of freedom, message boards, agree with*

*GRAMMER: EXPRESSING ABILITY / PERMISSION / PROHIBITION (BE ABLE TO, BE ALLOWED (TO), BE PERMITTED (TO), BE PROHIBITED FROM)*

It is possible to use ***be able to*** instead of ***can*** (*e.g. He* ***is able to*** *translate this article).*

When someone is managed to do something in one particular situation we use ***was/were able to*** (*e.g. He* ***was able to*** *solve this problem in the end*).

We use ***be allowed to, be permitted*** ***to*** to express permission.

We use ***be prohibited from*** to express prohibition.

*1. Complete these sentences with: be able to, be allowed (to), be permitted (to), be prohibited from*

1. Unauthorized users are people who **\_\_\_\_\_\_\_\_\_\_\_\_\_\_** access to any part or functions of the system.

2. Unauthorized users include employees who **\_\_\_\_\_\_\_\_\_\_\_** accessing the system, former employees who no longer \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_to access the system, and outsiders such as hackers and intruders.

3. Controls must **\_\_\_\_\_\_\_\_\_\_** identify and exclude access from these people.

4. Some users might **\_\_\_\_\_\_\_\_\_\_\_**to view data but not update it, and other users can update only certain data fields.

5. Authorization is the process of determining whether a user **\_\_\_\_\_\_\_\_\_\_\_** to access a specific resource for a particular purpose.

*WRITING*

*Write an email to your friend (a system* *developer) and* *ask him/her to explain to you* *what security controls you need to implement to protect your personal data.*

**5.4. SECURE TRANSACTIONS**

*SPEAKING AND VOCABULARY:**SECURE TRANSACTIONS*

## *1. Look at these extracts from the text. What do the words in bold refer to?*

1. **They** require a standard set of methods and protocols.

2. **This** was later adopted as an Internet standard.

3. **They** verify each other’s identity.

4. All of the messages to establish a secure connection are sent using **it**.

5. IPSec can replace or complement **it**.

6. **It** is enhanced when HTTPS documents are sent over secure TLS or IPSec channels.

*2. Read the text and answer these questions:*

1. What Internet protocols are used to support secure transaction?

2. Where can IPSec be implemented?

3. What does HTTPS support?

4. How can the sender and receiver establish secure transaction?

**SECURE TRANSACTIONS**

Secure electronic transactions require a standard set of methods and protocols that address authentication, authorization, privacy, and integrity. Netscape originally developed the *Secure Sockets Layer (SSL)* to support secure transactions. SSL was later adopted as an Internet standard and renamed *Transport Layer Security (TLS)*, though the original name, SSL, is still widely used.

TLS is a protocol for a secure channel to send messages over the Internet. The sender and receiver first establish a connection using ordinary Internet protocols and then ask each other to create a TLS connection. The sender and receiver then verify each other’s identity by exchanging and verifying identity certificates. At this point, either or both have exchanged public keys, so they can send secure messages. Because asymmetric encryption is quite slow and difficult, the two entities agree on a protocol and encryption method, usually a single-key encryption method. Of course, all of the messages to establish a secure connection are sent using the public key/private key combination. After the encryption technique has been decided and the secret, single key has been transmitted, all subsequent transmission is done using the secret, single key.

*IP Security (IPSec)* is a newer Internet standard for secure message transmission. IPSec is implemented at a lower layer of the network protocol stack, which enables it to operate with greater speed. IPSec can replace or complement SSL. Both protocols can be used at the same time to provide an extra measure of security. IPSec supports more secure encryption methods than SSL, but these methods are not yet fully deployed on the Internet.

*Secure Hypertext Transport Protocol* (HTTPS or HTTP-S) is an Internet standard for securely transmitting Web pages. HTTPS supports several types of encryption, *digital signing*, and *certificate exchange* and verification.

A *digital signature* is a technique in which a document is encrypted using a private key to verify who wrote the document. If you have the public key of an entity, and that entity sends you a message with its private key, you can decode it with the public key. You know that the party is the one you want to communicate with because that entity is the only one who can encode a message with that private key. The encoding of a message with a private key is called *digital signing.*

A certificate, or *digital certificate*, is an institution’s name and public key (plus other information such as address, Web site URL, and validity date of the certificate) that is encrypted and certified by a third party. Many third parties are very well known and widely accepted certifying authorities, such as VeriSign or Equifax. In fact, they are so well known that their public keys are built right into Netscape and Microsoft Internet Explorer.

All modern Web browsers and servers support HTTPS. It is a complete approach to Web-based security, though security is enhanced when HTTPS documents are sent over secure TLS or IPSec channels.

Security is an important consideration in the development and deployment of information systems in today’s networked environment. Fortunately, many tools and programs are available and can be integrated into new systems as part of the total solution. System developers need to be aware of the need to include security measures and to be familiar with the latest tools and techniques.

*3. Read the text again and find the following.*

1) a protocol for a secure transmission channel;

2) encoding of a message with a private key;

3) an institution’s name and public key;

4) a standard for security in the network;

5) a standard for secure transmission of Web pages.

*4. Correct the technical mistakes in the following sentences.*

1*.* TLS was later adopted as an Internet standard and renamed *Secure Sockets Layer (SSL).*

2. Because asymmetric encryption is quite slow and difficult, the two entities agree on a protocol and decryption method.

3. HTTPS supports a single type of encryption.

4. IPSec is implemented at a higher layer of the network protocol stack.

5. IPSec and SSL can be used separately to provide an extra measure of security.

*GRAMMER: RELATIVE CLAUSES WITH WHO, THAT, WHICH*

A clause is a part of a sentence. A relative clause tells us which person or thing the speaker means (*e.g. The investigator* ***who*** *carries out the research*).

A non-defining relative clause gives additional information about the person or thing which is not essential to the meaning of the main sentence. Non-defining relative clauses use relative pronouns ***which, who, where***. A comma is put before the relative pronoun (*e.g. A research was conducted. The research proved the hypothesis. A research was conducted,* ***which*** *proved the hypothesis*).

A defining relative clause identifies the person or thing and gives necessary information which is essential to the meaning of the main sentence. Defining relative clauses are used in definitions (*e.g. A computer is a machine* ***that*** *can do arithmetical and logical operations*).

***Which*** is used to refer to things and ***who*** is used to refer to people. ***That*** can replace ***which*** or ***who***. Comma is not put before ***which, who, that*** in defining relative clauses

*Complete these sentences with suitable relative pronouns who, that or which.*

1. An entity \_\_\_\_\_\_\_ wants a certificate with his/her name and public key goes to a certifying authority and buys a certificate.

2. The encryption of messages is an effective technique \_\_\_\_\_\_\_\_ enable a secure exchange of information between two entities \_\_\_\_\_\_\_ have appropriate keys.

3. In 1969, Intel introduced a 1K-bit memory chip, \_\_\_\_\_\_\_ was much larger than anything else available at the time.

4. Some DBMSs rely on the operating system to identify the user \_\_\_\_\_\_ is attempting to access data, \_\_\_\_\_\_\_\_ relieves the user from having to identify himself or herself multiple times.

5. System developers need to work closely with business users \_\_\_\_\_\_ are knowledgeable about accounting principles to prevent fraud.

6. Another drawback was that the language, used in programming was machine language, \_\_\_\_\_\_ uses numbers, rather than the present-day higher-level languages, which are more like English.

7. A thief or eavesdropper \_\_\_\_\_\_\_ steals or intercepts encrypted data receives a meaningless group of bits that are difficult or impossible to convert back into the original data.

8. Some of the controls must be integrated into the application programs \_\_\_\_\_\_\_ are being developed and the database \_\_\_\_\_\_\_ supports them.

9. Unauthorized users are people \_\_\_\_\_\_ are not allowed access to any part or functions of the system.

*WRITING*

*Write an email to the potential receiver of your confidential business information and* *discuss the issues of secure Internet transaction.*

**5.5. INFORMATION ETHICS**

*SPEAKING AND VOCABULARY:**INFORMATION ETHICS*

*1. Continue the following sentences (1 – 5), choosing their correct endings (a – e).*

1. Information systems should be designed to

2. The growth of the Internet has increased

3. People have downloaded music and movies at no charge and

4. Many of the IT breakthroughs in recent years, the importance of ethics and human values

5. Business managers must try to create a working environment in which ethical dilemmas can

a) in apparent violation of copyright laws.

b) be discussed openly, objectively, and constructively.

c) ensure accuracy and not invade a person’s privacy.

d) has been underemphasized with a range of consequences.

e) the risk that information technology will be used unethically.

*2. Read the text and answer these questions:*

1. What are the major issues of public concern about the ethical use of information technology?

2. Why must managers consider the ethical dimension of the business use of IT?

3. What are the principles of ethical conduct in the use and development of IT?

4. What are the basic ethical issues of the information age, highlighted by R. Mason?

**INFORMATION ETHICS**

The use of information technology in business has major impacts on society and thus raises serious ethical considerations in areas such as privacy, crime, health, working conditions, individuality, and employment. However, you should realize that IT can have a beneficial effect as well as a negative effect in each of these areas.

The growth of the Internet, the ability to capture and store vast amounts of personal data, and greater reliance on information systems in all aspects of life have increased the risk that information technology will be used unethically. In the midst of the many IT breakthroughs in recent years, the importance of ethics and human values has been underemphasized – with a range of consequences. Here are some examples that raise public concern about the ethical use of information technology:

• Many employees have their email and Internet access monitored while at work, as employers struggle to balance their need to manage important company assets and work time with employees’ desire for privacy and self direction.

• Millions of people have downloaded music and movies at no charge and in apparent violation of copyright laws at tremendous expense to the owners of those copyrights.

• Organizations contact millions of people worldwide through unsolicited email (spam) as an extremely low-cost marketing approach.

• Hackers break into databases of financial and retail institutions to steal customer information, then use it to commit identity theft – opening new accounts and charging purchases to unsuspecting victims.

• Students around the world have been caught downloading material from the Web and plagiarizing content for their term papers.

• Web sites plant cookies or spyware on visitors’ hard drives to track their online purchases and activities.

Unlike most conventional tools, IT has a profound effect on society. IT professionals and users need to recognize this fact when they formulate policies that will have legal ramifications and affect the well-being of millions of consumers. In the business world, important decisions are too often left to the technical experts. General business managers must assume greater responsibility for these decisions, but to do so they must be able to make broad-minded, objective decisions based on technical savvy, business know-how, and a sense of ethics. They must also try to create a working environment in which ethical dilemmas can be discussed openly, objectively, and constructively.

Richard O. Mason (a professor of Management Information Sciences at Southern Methodist University, Dallas) has posted four basic ethical issues that deal with the vulnerability of people to the IT:

*Privacy.* What information about one’s self or one’s association must a person reveal to others, under what conditions and with what safeguards? What things can people keep to themselves and not be forced to reveal to others?

*Accuracy*. Who is responsible for the authenticity, fidelity and accuracy of the information? Who is to be held accountable for errors in information and how is the injured party to be made whole?

*Property*. Who owns information? What are the just and fair prices for its exchange? Who owns the channels especially the airways through which the information is transmitted? How this access to this resource be allocated?

*Accessibility*. What information does a person or an organization have a right or a privilege to obtain, under what conditions and with what safeguards?

Mason’s ideas could serve as the basis for many proposals being debating concerning privacy, censorship and accessibility of the Internet. Information systems should be designed to ensure accuracy and not invade a person’s privacy. Channels of information should be protected and information made accessible to avoid information illiteracy and deprivation. Finally, information systems should be designed to protect an individual’s intellectual capital from unauthorized exposure, loss or damage. Developing, protecting and enforcing this social contract then become the responsibility of end users, managers and IS professionals.

*3. Match the words (1 – 8) with the correct meanings (a – h).*

1) ethics a) spam

2) breakthrough b) small files

3) know-how c) a system of moral principles

4) unsolicited email d) advance

5) plagiarize e) consequences

6) cookies f) shrewdness and practical knowledge

7) ramifications g) practical knowledge or skills

8) savvy h) to use as one’s own

*4. Match the words (1 – 12) with the words (a – m) to make collocations and say what type they are (verb+noun; adjective+noun, etc).*

1) technical a) laws

2)ethical b) purchases

3) beneficial c) illiteracy

4)public d) savvy

5) download e) policy

6) apparent f) considerations

7) copyright g) music

8)plagiarizing h) know-how

9) online i) concern

10) formulate j) violation

11)business l) effect

12) information m) content

*GRAMMER: QUESTIONS*

In questions we place the auxiliary verb before the subject

***Present simple***

***Do*** *computers* ***understand*** *spoken English? How* ***does*** *it* ***function****? What* ***is*** *Java applet? Where* ***are*** *they* ***designed****? Who* ***operates*** *the machine? (The subject is the question word).*

***Present Continuous***

*What* ***are*** *you* ***looking*** *for? When* ***is*** *he* ***coming****? Why* ***are*** *these technologies* ***being devised****? What* ***is causing*** *this fault? (The subject is the question word)*

***Future with will***

*When* ***will*** *you* ***expect*** *him to come? How* ***will*** *they* ***be using*** *expert systems? Who* ***will*** *complete this research? (The subject is the question word) When* ***will*** *they* ***have detected*** *the intrusion? By what time* ***will*** *the intrusion* ***have been detected****?*

***Past simple***

*Where* ***did*** *they* ***develop*** *this program? When* ***was*** *the term* ***invented****? How* ***were*** *the viruses* ***spread****? Who* ***completed*** *the research? (The subject is the question word).*

***Past Continuous***

*When* ***was*** *he* ***developing*** *a program? What* ***were*** *they* ***doing*** *during the break? Why* ***were*** *the machines* ***being fixed*** *at that time? Who* ***was******interviewing*** *you? (The subject is the question word)*

***Present perfect***

***Have*** *you ever* ***used*** *Adobe Photoshop tools?* ***Has*** *she ever* ***worked*** *in another country?* ***Has*** *your information* ***been protected*** *yet? How many jobs* ***has*** *he* ***applied*** *for this year? How many computers* ***have been infected*** *recently? (The subject is the question word).*

***Present perfect continuous***

*How long* ***have*** *you* ***been writing*** *programs in C? What* ***has been going*** *on in your company for the last few days? (The subject is the question word).*

*1. Find the following collocations in the text above, and then make your own sentences with them.*

to raise public concern, to commit identity theft, to plant cookies, to affect the well-being, to assume greater responsibility, to be forced to reveal.

*2. Make questions to have the following answers.*

1. What \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_?

Information technology impacts on society and thus raises serious ethical considerations in many areas.

1. Who\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_?

Many employees have their email and Internet access monitored while at work.

3. How\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_?

Information systems should be designed to ensure accuracy and not invade a person’s privacy.

4. What\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_?

IT professionals and users formulate policies that will have legal ramifications.

5. Where \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_?

Organizations contact millions of people worldwide through unsolicited email.

6.Where \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_?

Hackers break into databases of financial and retail institutions to steal customer information.

*WRITING*

*Write an essay (80 – 120 words)* *about the ethical issues that deal with the vulnerability of people to the IT.*

**UNIT 6. COMPUTERS TODAY AND TOMORROW**

**6.1. Artificial Intelligence**

# **6.2. Virtual Reality**

**6.3. Current trends in system development**

**6.4. Applications of nanotechnology**

**6.5. Gestural interfaces**

**6.1. ARTIFICIAL INTELLIGENCE**

*SPEAKING AND VOCABULARY: ARTIFICIAL INTELLIGENCE*

## *1. Look at these extracts from the text. What do the words in bold refer to?*

1*.* **It** is concerned with getting computers to do tasks that require human intelligence.

2. **This** involves a human communicating with a human and with a computer in other rooms.

3. **They** will eventually be really intelligent.

4. **This** allows you to look up Chinese sentences, and tells you how to reply to them.

5. **They** can be used to produce useful programs that conventionally require human intelligence.

*2. Read the text and answer these questions:*

* + 1. What tasks is artificial intelligence concerned with?
    2. Why do people want to automate human intelligence?
    3. Does a field of AI overlap with computer science?

4. What sciences are different areas of AI closely related to?

5. Can true intelligence be achieved by a computer?

6. How can the intelligence of a machine be measured due to Alan Turing’s test?

7. Does the “Chinese room” prove the intelligence of a machine?

**ARTIFICIAL INTELLIGENCE**

Artificial intelligence(AI) is a broad field, and means different things to different people. It is concerned with getting computers to do tasks that require human intelligence. However, there are many tasks, which computers can do very easily. Conversely, there are many tasks that people do without even thinking – such as recognising a face – which are extremely complex to automate. AI is concerned with these difficult tasks, which seem to require complex and sophisticated reasoning processes and knowledge.

People might want to automate human intelligence for a number of different reasons. One reason is simply to understand human intelligence better. For example, we may be able to test and refine psychological and linguistic theories by writing programs, which attempt to simulate aspects of human behaviour. Another reason is simply so that we have smarter programs. We may not care if the programs accurately simulate human reasoning, but by studying human reasoning, we may develop useful techniques for solving difficult problems.

AI is a field that overlaps with computer science rather than being a strict subfield. Different areas of AI are more closely related to psychology, philosophy, logic, linguistics, and even neurophysiology.

Artificial intelligence research makes the assumption that human intelligence can be reduced to the manipulation of symbols, and that it does not matter what medium is used to manipulate these symbols - it does not have to be a biological brain! This assumption does not go unchallenged among philosophers etc. Some argue that true intelligence can never be achieved by a computer, but requires some human property, which cannot be simulated. There are endless philosophical debates on this issue.

The most well known contributions to the philosophical debate are Turing’s “Turing test” paper, and Searle’s “Chinese room”. The best way to gauge the intelligence of a machine is British computer scientist [Alan Turing](http://ei.cs.vt.edu/~history/Turing.html)'s test. He stated that a computer would deserve to be called intelligent if it could deceive a human into believing that it was human. Very roughly, Turing considered how you would be able to conclude that a machine was intelligent. He argued that the only reasonable way was to do a test. The test involves a human communicating with a human and with a computer in other rooms, using a computer for the communication. The first human can ask the other human/computer any questions they like, including very subjective questions like “What do you think of this Poem”. If the computer answers so well that the first human cannot tell which of the two others is human, then we say that the computer is intelligent.

Searle argued that just behaving intelligently was not enough. He tried to demonstrate this by suggesting a thought experiment (the “Chinese room”). Imagine that you do not speak any Chinese, but that you have a huge rulebook, which allows you to look up Chinese sentences, and tells you how to reply to them in Chinese. You do not understand Chinese, but can behave in an apparently intelligent way. He claimed that computers, even if they appeared intelligent, would not really be, as they would be just using something like the rulebook of the Chinese room. Many people go further than Searle, and claim that computers will never even be able to appear to be really intelligent (so will never pass the Turing test). There are therefore a number of positions that you might adopt:

- Computers will never even appear to be really intelligent, though they might do a few useful tasks that conventionally require intelligence.

- Computers may eventually appear to be intelligent, but in fact they will just be simulatingintelligent behaviour, and not really be intelligent.

- Computers will eventually be really intelligent.

- Computers will not only be intelligent, they will be conscious and have emotions.

Though computers can clearly behave intelligently in performing certain limited tasks, full intelligence is a very long way off. However, these philosophical issues rarely impinge on AI practice and research. It is clear that AI techniques can be used to produce useful programs that conventionally require human intelligence, and that this work helps us understand the nature of our own intelligence.

*3. Match the sentence beginnings (1 – 5) with the correct endings (a – e).*

1. We may be able to test and refine psychological and linguistic theories by

2. Some argue that true intelligence can never be achieved by a computer, but

3. Computers can clearly behave intelligently in

4. Many people claim that computers will never even be able to

5. These philosophical issues rarely

a) requires some human property, which cannot be simulated.

b) performing certain limited tasks.

c) impinge on AI practice and research.

d) writing programs, which attempt to simulate aspects of human behaviour.

e) appear to be really intelligent.

*4. Complete these sentences with the words given below.*

1. Artificial intelligence \_\_\_\_\_\_\_\_makes the assumption that human intelligence can be reduced to the manipulation of symbols.

2. AI techniques help us understand the nature of our own\_\_\_\_\_\_\_\_.

3. People might want to automate human intelligence for a number of different\_\_\_\_\_\_.

4. Chess-playing systems are primitive examples of \_\_\_\_\_\_\_\_ learning systems.

5. Genetic algorithm software uses Darwinian (survival of \_\_\_\_\_\_\_) functions.

6. There are endless philosophical \_\_\_\_\_\_\_\_on the issue of AI.

7. Full intelligence is a very long way off, though computers can clearly \_\_\_\_\_\_\_\_ intelligently.

*intelligence,*  *debates,* *research,* *adaptive,*  *behave,*  *the fittest,*  *reasons*

*5. Match the words (1 – 7) with the words (a – g) to make collocations*

1) reasoning a) tasks

2) human b) theories

3) philosophical c) processes

4) thought d) field

5) limited e) experiment

6) broad f) behaviour

7) to refine g) debates

# *GRAMMER: CHOOSING ACTIVE OR PASSIVE*

Passive forms are often used in technical texts. As there the focus is mainly on the process or action and the thing acted upon (*e.g. A cylinder of silicon* ***is sliced*** *into wafers, each about three inches in diameter, and wafer* ***is etched*** *repeatedly with a pattern of electrical circuitry*).

However, the active is also possible in sentences dealing with a process. When the verb is intransitive, it cannot take an object and therefore cannot be used in the passive (*e.g. All the tubes* ***burnt out***).

*1. Complete these sentences with the correct form of the verb in brackets*

*Cognitive Science*

This area of AI *(to base)* on research in biology, neurology, psychology mathematics and many allied disciplines. It *(to focus)* on researching how the human brain *(to work)* and how human can think and learn. The results of such research in human information processing *(to be)* the basis for the development of a variety of computer-based applications in AI. Applications in the cognitive science area of AI (to include) the development of expert systems and other knowledge-based systems that add a knowledge base and some reasoning capability to information systems. Adaptive learning systems *(to include)* also that can modify their behaviors based on information they (to acquire) as they operate.

Chess-playing systems *(to be)* primitive examples of such applications, though many more applications (*to implement)*. Fuzzy logic systems can process data that *(to be)* incomplete or ambiguous, that is, fuzzy data*.* Neural network software can learn by processing sample problems and their solutions. As neural nets *(to start)* to recognize patterns, they can begin to program themselves to solve such problems on their own. Genetic algorithm software *(to use)* Darwinian (survival of the fittest), randomizing and other mathematical functions to simulate evolutionary process that can generate increasingly better solutions to problems. And intelligent agents use expert systems and other AI technologies to serve as software surrogates for a variety of end user applications.

# 

*WRITING*

*Summarize the information about artificial intelligence (80 – 100 words) in the texts given above.*

# **6.2. VIRTUAL REALITY**

*SPEAKING AND VOCABULARY: VIRTUAL REALITY*

## *1. Complete these sentences with the words given below.*

1. Virtual reality had its \_\_\_\_\_\_\_\_in efforts to build more natural, realistic, multisensory human/computer interfaces.

2. The use of virtual reality is limited by the performance and cost of its \_\_\_\_\_\_\_\_.

3. Virtual reality allows you \_\_\_\_\_\_\_\_\_\_computer-simulated objects, entities and environments as if they actually exist.

4. You can experience computer-simulated “virtual worlds” three-dimensionally through sight, sound and \_\_\_\_\_\_\_\_.

5. VR designers are creating everything from virtual weather \_\_\_\_\_\_ and virtual wind tunnels to virtual cities and virtual \_\_\_\_\_\_\_\_markets.

6. Users that can be anywhere in the world use VR systems to work alone or together at a \_\_\_\_\_\_\_\_site.

*technology, touch,* *patterns, origin, remote, securities, to interact with*

*2. Read the text and answer these questions:*

1. What devices does VR rely on?

2. Why is VR called a telepresence?

3. What are current applications of virtual reality?

4. What is the most widely used industrial application of VR?

5. What are the most promising applications of VR in IT?

6. Are there any limitations of VR applications?

### VIRTUAL REALITY

Virtual reality (VR) is computer-simulated reality. Virtual reality is a fast-growing area of artificial intelligence that had its origin in efforts to build more natural, realistic, multisensory human/computer interfaces. So virtual reality relies on multisensory input/output devices such as a tracking headset with video goggles and stereo earphones, a data glove or jumpsuit with fiber-optic sensors that track your body movements, and a walker that monitors the movement of your feet. Then you can experience computer-simulated “virtual worlds” three-dimensionally through sight, sound and touch. Thus, virtual reality is also called telepresence. For example, you can enter a computer-generated world, look around and observe its contents, pick up and move objects and move around in it at will. Thus, virtual reality allows you to interact with computer-simulated objects, entities and environments as if they actually exist.

Current applications of virtual reality are wide ranging and include computer-aided design (CAD), medical diagnostics and treatment, scientific experimentation in many physical and biological sciences, flight simulation for training pilots and astronauts, product demonstrations, employee training and entertainment, especially 3-D video arcade games. CAD is the most widely used industrial VR application. It enables architects and other designers to design and test electronic 3-D models of products and structures by entering the models themselves and examining, touching and manipulating sections and parts from all angles.

VR designers are creating everything from virtual weather patterns and virtual wind tunnels to virtual cities and virtual securities markets. For example, by converting stock market and other financial data into three-dimensional graphic form, securities analysts can use VR systems to more rapidly observe and identify trends and exceptions in financial performance. Also promising are applications in information technology itself. This includes the development of 3-D models of telecommunications networks and databases.

VR becomes telepresence when users that can be anywhere in the world use VR systems to work alone or together at a remote site. Typically, this involves using a VR system to enhance the sight and touch of a human who is remotely manipulating equipment to accomplish a task. Examples range from virtual surgery, where surgeon and patient may be on either side of the globe, to the remote use of equipment in hazardous environments such as chemical plants or nuclear reactors.

VR Limitations. The use of virtual reality seems limited only by the performance and cost of its technology. For example, some VR users develop cybersickness, such as eyestrain and motion sickness, from performance problems in the realism of VR systems. The cost of a virtual reality system is another limitation. A VR system consisting of a headset with goggles and headphones, a fiber–optic data glove, motion-sensing devices and a powerful engineering workstation with top-quality 3-D modelling software can exceed $ 50,000. If you want less cumbersome devices, more realistic displays and more natural sense of motion in your VR world, costs can escalate into several hundred thousand dollars. CAVEs (cave automatic virtual environments), virtual rooms that immerse you in a virtual reality experience, cost several million dollars to set up.

For example, the Market Risks Department of Morgan Stanly & Co. uses Discovery virtual reality software by Visible Decisions to model risks of financial investments in varying market conditions. Discovery displays three-dimensional results using powerful Silicon Graphics workstations.

*3. Read the text again and find the following.*

1) computer-simulated reality;

2) multisensory input/output devices;

3) virtual world created through sight, sound and touch;

4) a tunnel-like apparatus for producing an airstream of known velocity;

5) sickness which occurs during or after immersion into virtual reality;

6) a room-size visualization solution.

*4. Match the words (1 – 7) with the words (a – g) to make technical terms and translate them into Ukrainian.*

1) artificial a) objects

2) multisensory b) design

3) video c) devices

4) computer-simulated d) surgery

5) virtual e) intelligence

6) stereo f) sensors

7) computer-aided g) earphones

8) fiber-optic h) goggles

*5. Complete these sentences with the correct form of a phrasal verb given below*

1. Virtual reality\_\_\_\_\_\_\_\_\_ multisensory input/output devices.

2. You can enter a computer-generated world, look around and observe its contents, \_\_\_\_\_\_\_\_\_ and move objects and move around in it at will.

3. Virtual reality allows you \_\_\_\_\_\_\_\_\_\_computer-simulated objects, entities and environments as if they actually exist.

4. The use of virtual reality only \_\_\_\_\_\_\_\_\_the performance and cost of its technology.

5. A VR system \_\_\_\_\_\_\_a headset with goggles and headphones, a fiber–optic data glove, motion-sensing devices and a powerful engineering workstation with top-quality 3-D modelling software

*pick up, consist of, to interact with, rely on, limit by*

*6. Read the text below. Fill in the –ing forms and define their functions.*

*Immersion into Virtual Reality*

In order to let the users/operators have the sense of \_\_\_\_\_\_\_\_immersed in the virtual environment, two important devices are needed: Data Glove and Head-Mounted Display (HMD).

Data Glove is a kind of virtual reality input device that allows a user to react to the virtual environment. By \_\_\_\_\_\_\_\_\_this data glove on the hand, the robotic arm coupled to this data glove will replicate exactly the way this data glove is manipulated by the user. The arm can be directed to, say, pick up an object. Once the object is in hand, information is sent back to the data glove to apply stress to the user movement, inducing a sense of \_\_\_\_\_\_\_\_the object.

HMD is a device that cuts off visual and audio sensations from the \_\_\_\_\_\_\_\_\_world and replaces them with computer generated three-dimensional images.

Imagine you are in the dining room at home. Once you put on a HMD connected to a computer, you may feel that you have been teleported to the surface of Mars, with the two moons, the Phobos and Deimos, and numerous stars \_\_\_\_\_\_\_\_in the distant horizon. What is in front of you is no longer the dining table but the foot of the gigantic Olympus Mons: a volcano larger than any mountain on Earth. When you take a step forward, your point of view (3D)moves forward in this virtual space. You find yourself no longer in the dining room; you are in the cyberspace of Mars you came across in science fiction. Everything is so real that you cannot deny you are \_\_\_\_\_\_\_\_on that planet.

These are all due to the 3D computer generated imagesproduced by the sophisticated computer. Besides, the head-tracking system senses the exact position and orientation of your head, while the computer uses this set of data to update the view on the display.

A Head-Mounted Display consists of six major components :

1) the housing

2) head strap

3) liquid crystal display ( LCD ) screens

4) aspheric lenses

5) focusing rings

6) video cable.

The **\_\_\_\_\_\_\_\_**holds the LCD screens in a fixed position relative to each other to reduce the possibility of image misalignment, and at a sufficient spacing from the operator’s eyes to alloy spectacles to be worn. The \_\_\_\_\_\_\_\_ moves the aspheric lens closer or further relative to the LCD, to facilitate \_\_\_\_\_\_\_\_of the image and to adjust for accommodation variances between different users.

The aspheric lens is composed of two convex surfaces each \_\_\_\_\_\_\_\_an aspheric shape.

Head-mounted displays, BOOMs (binocular omni orientation monitor), and the CAVE are the most popular output devices. The BOOM is similar to a head-mounted display but without the hassle of a helmet. Its \_\_\_\_\_\_\_\_\_box suspends from a two-part \_\_\_\_\_\_\_\_\_\_arm. Simply place your eyes into the BOOM's two eyepieces and you are in the virtual world. The CAVE, however, is slightly different. Instead of \_\_\_\_\_\_\_on a helmet or looking into an eyepiece, you step into a small room. This device gives you the distinct advantage of enjoying the sensation of being "in" the data. The CAVE also has other advantages. Because the viewer only needs to wear a special pair of glasses, multiple people can enjoy the experience at the same time. Currently the CAVE is the only viewing device that allows for unrestricted movement.

*focusing, holding, viewing, putting,wearing, surrounding, focusing, being, rotating, having, exploring, glowing, housing*

*WRITING*

*Summarize the information about virtual reality (80 – 100 words) in the texts given above.*

**6.3. CURRENT TRENDS IN SYSTEM DEVELOPMENT**

*SPEAKING AND VOCABULARY:**CURRENT TRENDS IN SYSTEM DEVELOPMENT*

***1.*** *Continue the following sentences (1 – 5), choosing their correct endings (a – e).*

1. Supply chain management systems trigger instant production of new products

2. Computer technology is everywhere and

3. XP is really an attempt to take the best practices of

4. The practices and methods of XP are designed to

5. Developers always need courage to face the harsh choice of

a) software development and extend them “to the extreme.”

b) ensure that open, frequent communication occurs.

c) affects almost every aspect of our lives.

d) based on sales and inventory levels halfway around the world.

e) doing things right or throwing away bad code and starting over.

*2. Read the text and answer these questions:*

1*.* What does ubiquitous computing stand for?

2. What are the principles of agile development philosophy?

3. What are the main characteristics of Extreme programming?

4. What is XP designed for?

**CURRENT TRENDS IN SYSTEM DEVELOPMENT**

Computing capability still continues to advance at an astounding rate. In addition, all sorts of new uses and devices for computing have been created, including cell phones with digital cameras, handheld PCs, Internet-enabled telephones, appliances with embedded computer chips, and radio-frequency ID chips on products in retail stores. Large-scale systems, although not as obvious to consumers, drive many of the basic activities on which our society is based. Such activities as money transactions between banks and other financial institutions support our banking and credit-card industries. Behind the scenes, supply chain management systems trigger instant production of new products based on sales and inventory levels halfway around the world. Transportation scheduling and information sharing between carriers and shippers enable people and goods to travel worldwide with minimal disruptions. Today we speak of ubiquitous computing, meaning that computer technology is everywhere and affects almost every aspect of our lives. Just as one set of computing and system problems is solved, an entirely new need or desire is uncovered. The quest for improved business and consumer computing solutions continues unabated. Because of these trends, the long-term outlook for information systems specialists is incredibly positive. The down-side for the industry is that the effort to keep current is extremely demanding.

*The agile development philosophy and agile modeling*. The highly volatile marketplace has forced businesses to respond rapidly to new opportunities. Sometimes new opportunities appear in the middle of implementing another business initiative. To survive, businesses must be agile. *Agility* – being able to change directions rapidly, even in the middle of a project – is the keystone of *Agile Development*. Agile Development is a philosophy and set of guidelines for developing software in an unknown, rapidly changing environment. It provides an overarching philosophy to be used with a specific development methodology such as the *Unified Process*. For example, we identified the UP as being somewhat adaptive, but being adaptive is not the same as being agile. Some UP projects may adopt many agile philosophies, and others may use fewer.

Related to Agile Development, *Agile Modeling* is a philosophy about how to build models, some of which are formal and detailed and others sketchy and minimal.

*Extreme programming (XP)* is an adaptive, agile development methodology that was created in the mid-1990s. XP is really an attempt to take the best practices of software development and extend them “to the extreme.” Extreme programming has the following characteristics:

• Takes proven industry best practices and focuses on them intensely;

• Combines those best practices (in their intense form) in a new way to produce a result that is greater than the sum of the parts.

The *four core values of XP* – communication, simplicity, feedback, and courage – drive its practices and project activities.

One of the major causes of project failure has been a lack of open *communication* with the right players at the right time and at the right level. Effective communication involves not only documentation but also open verbal discussion. The practices and methods of XP are designed to ensure that open, frequent communication occurs.

*Simplicity*. XP includes techniques to reinforce this principle and make it a standard way of developing systems.

*Feedback.* Feedback on functionality and requirements should come from the users, feedback on designs and code should come from other developers, and feed-back on satisfying a business need should come from the client. XP integrates feedback into every aspect of development.

*Courage.* Developers always need courage to face the harsh choice of doing things right or throwing away bad code and starting over. But all too frequently they have not had the courage to stand upto a too-tight schedule, resulting in bad mistakes. XP practices are designed tomake it easier to give developers the courage to do it right.

*3. Read the text again and find the following.*

1) the management of the flow of goods and services;

2) pervasive computing;

3) being able to change directions rapidly;

4) a set of guidelines for developing software in an unknown, rapidly changing environment;

5) a specific development methodology;

6) a philosophy about how to build models;

7) an attempt to take the best practices of software development and extend them “to the extreme”.

*4. Match the words (1 – 9) with the words (a – e) to make collocations.*

1) astounding a) values

2) to trigger b) guidelines

3) transportation c) outlook

4) information d) rate

5) long-term e) communication

6) volatile f) scheduling

7) a set of g) marketplace

8) core h) instant production

9) a lack of i) sharing

*GRAMMER: THE INFINITIVE*

The Infinitive has six forms:

Indefinite: *to write*

Continuous:  *to be writing*

Perfect: *to have been written*

Perfect Continuous: *to have been writing*

Indefinite Passive: *to be written*

Perfect Passive:  *to have been written*

Infinitive is used with to (e.g. We expected ***to******see*** the results. They agreed ***to come***)

Infinitive is used without *to:*

after modal verbs can, may, could, might, must, should (*e.g. You may* ***apply*** *for the job*. *He can* ***fix*** *your computer);*

after *had better, would rather, would sooner* (*e.g. You would rather* ***stay*** *at home. You had better* ***have written*** *your report by the time they arrive*);

after *feel, hear, let, make, see* in the active (*e.g. They made me* ***pass*** *this exam (active). He was made* ***to pass*** *this exam (passive*)

*1. Choose the correct words to complete these sentences.*

1. Focusing only on working software can also be self-defeating, so developers must \_\_\_\_\_\_\_\_\_two important objectives.

**a** to consider **b** to consider **c** considering

2. Sometimes several intermediate steps are needed before the final code can \_\_\_\_\_\_\_.

**a** to write **b** be written **c** write

3. XP planning focuses on making a rough plan quickly and then \_\_\_\_\_\_\_\_it as things become clearer.

**a** refine **b** to refine **c** refining

4. It provides an overarching philosophy \_\_\_\_\_\_\_\_\_with a specific development methodology such as the *Unified Process*.

**a** use **b** to use **c** to be used

5. The down-side for the industry is that the effort \_\_\_\_\_\_\_\_current is extremely demanding.

**a** keeping **b** to keep **c** keep

6. As with everything else, the design must \_\_\_\_\_\_\_\_immediately by reviewing

it along with coding and testing.

**a** to verify **b** verify **c** be verified

1. This practice is XP’s unique and interesting approach to \_\_\_\_\_\_\_an architectural vision.

**a** define **b** defining **c** be defined

1. Scrum is responsive to a highly changing, dynamic environment in which users might not \_\_\_\_\_\_\_\_exactly what is needed.

**a** know **b** to know **c** to be known

1. For any function \_\_\_\_\_\_\_\_\_\_in the final system, it must first be placed on the product backlog.

**a** to include **b** include **c** to be included

1. If a response to an action is going to take significant time, feedback is required that lets the user \_\_\_\_\_\_\_\_\_the system has heard the request.

**a** to know **b** know **c** knowing

*WRITING*

*Write an essay (80 – 120 words)* *about the agile development philosophy and current challenges in IT*

**6.4. APPLICATIONS OF NANOTECHNOLOGY**

*SPEAKING AND VOCABULARY:**NANOTECHNOLOGY*

## *1. Complete these sentences with the words given below.*

1. Companies are developing nanomaterials that will make \_\_\_\_\_\_\_\_\_not only in the taste of food, but also in food safety.

2. \_\_\_\_\_\_\_\_\_\_in nanomaterials make lightweight spacecraft and a cable for the space elevator possible.

3. There already exist over 800 everyday commercial products that \_\_\_\_\_\_\_\_ nanoscale materials and processes.

4. Nanoparticles are the size of molecules and can deliver drugs directly to \_\_\_\_\_\_\_\_\_cells in your body.

5. Catalysts made from nanoparticles have a greater surface area to \_\_\_\_\_\_\_\_\_the reacting chemicals than catalysts made from larger particles.

6. Because of the small size of nanotubes, nanowires, or nanoparticles, a few gas molecules are \_\_\_\_\_\_\_\_\_to change the electrical properties of the sensing elements.

*advancements, sufficient, diseased, rely on, interact with, a difference*

*2. Read the text and answer these questions:*

1. What does nanotechnology stand for?

2. What does the science of nanotechnology deal with?

3. What are the benefits of nanotechnology applications in different areas of science and industry?

4. Are there any negative effects of nanotechnology applications?

5. How can the advancements in nanomaterials affect our lives in the future?

**APPLICATIONS OF NANOTECHNOLOGY**

The term nanotechnology comes from the combination of two words: the Greek numerical prefix *nano* referring to a billionth and the word *technology*. Nanotechnology is generally considered to be at a size below 0:1 m or 100 nm (a nanometer is one billionth of a meter). Nanoscale science studies the phenomena, properties, and responses of materials at atomic, molecular, and macromolecular scales, and in general at sizes between 1 and 100 nm.

Most benefits of nanotechnology depend on the fact that it is possible to tailor the essential structures of materials at the nanoscale to achieve specific properties, thus greatly extending the well-used toolkits of materials science. There already exist over 800 everyday commercial products that rely on nanoscale materials and processes:

## Nanotechnology Applications in:

*Medicine*

Researchers are developing customized nanoparticles the size of molecules that can deliver drugs directly to diseased cells in your body.  When it's perfected, this method should greatly reduce the damage treatment such as chemotherapy does to a patient's healthy cells.

*Electronics*

Nanotechnology holds some answers for how we might increase the capabilities of electronics devices while we reduce their weight and power consumption.

*Food*

Nanotechnology is having an impact on several aspects of food science, from how food is grown to how it is packaged. Companies are developing nanomaterials that will make a difference not only in the taste of food, but also in food safety, and the health benefits that food delivers.

*Fuel cells*

Nanotechnology is being used to reduce the cost of catalysts used in fuel cells to produce hydrogen ions from fuel such as methanol and to improve the efficiency of membranes used in fuel cells to separate hydrogen ions from other gases such as oxygen.

*Space*

Nanotechnology may hold the key to making space-flight more practical. Advancements in nanomaterials make lightweight spacecraft and a cable for the space elevator possible. By significantly reducing the amount of rocket fuel required, these advances could lower the cost of reaching orbit and traveling in space.

*Fuels*

Nanotechnology can address the shortage of fossil fuels such as diesel and gasoline by making the production of fuels from low grade raw materials economical, increasing the mileage of engines, and making the production of fuels from normal raw materials more efficient.

*Better air quality*

Nanotechnology can improve the performance of catalysts used to transform vapors escaping from cars or industrial plants into harmless gasses. That's because catalysts made from nanoparticles have a greater surface area to interact with the reacting chemicals than catalysts made from larger particles. The larger surface area allows more chemicals to interact with the catalyst simultaneously, which makes the catalyst more effective.

*Cleaner water*

Nanotechnology is being used to develop solutions to three very different problems in water quality. One challenge is the removal of industrial wastes, such as a cleaning solvent called TCE, from groundwater. Nanoparticles can be used to convert the contaminating chemical through a chemical reaction to make it harmless. Studies have shown that this method can be used successfully to reach contaminates dispersed in underground ponds and at much lower cost than methods which require pumping the water out of the ground for treatment.

*Chemical sensors*

Nanotechnology can enable sensors to detect very small amounts of chemical vapors. Various types of detecting elements, such as carbon nanotubes, zinc oxide nanowires or palladium nanoparticles can be used in nanotechnology-based sensors. Because of the small size of nanotubes, nanowires, or nanoparticles, a few gas molecules are sufficient to change the electrical properties of the sensing elements. This allows the detection of a very low concentration of chemical vapors. Nanoscale sensors and devices may provide cost-effective continuous structural monitoring of the condition and performance of bridges, tunnels, rails, parking structures and pavements over time. Nanoscale sensors and devices may also support an enhanced transportation infrastructure that can communicate with vehicle-based systems to help drivers maintain lane position, avoid collisions, adjust travel routes to circumnavigate congestion, and other such activities.

*Transportation*

In addition to contributing to building and maintaining lighter, smarter, more efficient, and “greener” vehicles, aircraft, and ships, nanotechnology offers various means to improve the transportation infrastructure. Nano-engineering of steel, concrete, asphalt, and other cementitious materials, and their recycled forms, offers great promise in terms of improving the performance, resiliency, and longevity of highway and transportation infrastructure components while reducing their cost. New systems may incorporate innovative capabilities into traditional infrastructure materials, such as the ability to generate or transmit energy.

*3. Read the text again and find the following.*

1) is generally considered to be at a size below 0:1 m or 100 nm;

2) are the size of molecules;

3) diesel and gasoline;

4) one billionth of a meter;

5) the basic material from which a product is made;

6) traffic jam;

7) cementitious materials.

*4. Match the words (1 – 7) with the words (a – g) to make scientific and technical terms and translate them into Ukrainian.*

1) nanoscale a) fuels

2) hydrogen b) nanoparticles

3) lightweight c) systems

4) fossil d) sensors

5) customized e) ions

6) chemical f) spacecraft

7) vehicle-based g) vapors

*GRAMMER: PASSIVE REPORTING STRUCTURES*

We use passive reporting structures to report opinions and facts without naming the source. There are two common reporting structures:

**1) *It is (was) said*** *reported/thought/believed/known /expected* ***that +clause***

*(e.g.* ***It is reported that*** *the delegation arrives on Monday.)*

2) ***He is (was) expected to*** + infinitive

They are (were) known to +infinitive

(*e.g.* ***He is known to be*** *a prominent scientist.)*

*1. Rewrite these sentences using passive reporting structures.*

1. Scientific journals have reported that researchers are developing customized nanoparticles the size of molecules.

It has\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

1. They know that nanotechnology is used to develop solutions to three very different problems in water quality.

Nanotechnology is \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

1. People believe that nanotechnology is influenced on several aspects of food science.

It is \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

4. Companies expect that nanomaterials will make a difference not only in the taste of food, but also in food safety, and the health benefits.

Nanomaterials are\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

5.They believe that the amount of fuel is reduced.

It is \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

*WRITING*

*Write an essay making your own prediction about the possible fields of nanotechnology applications.*

**6.5. GESTURAL INTERFACES**

*SPEAKING AND VOCABULARY:**GESTURAL INTERFACES*

*1.**Continue the following sentences (1 – 5), choosing their correct endings (a – e).*

1. Because the system is small and largely software based, it could be

2. The WiSee researchers developed algorithms that amplify

3. Wi-Fi signals travel throughout a structure and don’t require users

4. The system which can be embedded into almost any type of device

5. Gestural interfaces would let doctors or nurses control

6. Apple has developed a camera based system for its iOS 7 beta that

a) to be in sight of the device they want to control.

b) tracks and identifies motions, and converts them into commands.

c) embedded in many types of devices.

d) displays, computers, or other devices without touching them.

e) the disturbances, which normally are too small to detect easily.

f) lets users control their iPhones via gestures such as hand swipes or head movements.

*2. Read the text and answer these questions:*

1. How long have gestural interfaces been investigated?

2. What are the functions of *Leap Motion Controller?*

3. What are the benefits of the gestural interfaces use?

4. Who can make the best use of gestural interfaces?

5. What are the recent gestural interfaces developments?

**GESTURAL INTERFACES**

Gestural interfaces have been the subject of research for more than 40 years. Microsoft’s 2010 release of the highly popular Kinect motionsensing input device for the Xbox 360 game console and Windows computers marked a major step forward for gestural interfaces in the marketplace. The company sold 8 million of the devices in the first two months they were available.

*Leap Motion Controller* is a small peripheral that plugs into a USB port and sits on a desk or table in front of a Windows- or Mac-based computer. Using two cameras to capture motion information and three infrared LEDs as light sources, the system tracks the movements of hands, fingers, finger joints, pens, or several other objects in an area 2 feet in front of, to the side of, and above the device. The company’s controller has little latency because it uses a small camera and its algorithms extract only the data required for the task at hand. Other algorithms let the system precisely recognize small objects and their movements which enables increased accuracy and the use of small gestures. Because the system is small and largely software based, it could be embedded in many types of devices.

WiSee University of Washington researchers have developed the *WiSee gestural interface* to control office or household systems such as TVs, computers, thermostats, and lights. The system sends out a stream of Wi-Fi signals. Hand or whole body gestures that people make in a room with such a device disturb the signal stream and cause small frequency shifts. The WiSee researchers developed algorithms that amplify the disturbances, which normally are too small to detect easily. Because the system works with Wi-Fi signals, it doesn’t require cameras or device instrumentation. Wi-Fi signals travel throughout a structure and don’t require users to be in sight of the device they want to control, as in the case with camera-based systems.

*eyeSight’s Touch Free*. This software-based technology uses real-time image processing and machine-vision algorithms to track users’ hand gestures and convert them into commands for a device. Touch Free processes images from a standard 2D video camera, infrared sensors, or 3D sensors, and looks for any object it has been trained to detect such as a hand, finger, or face. The system – which can be embedded into almost any type of device – then tracks and identifies motions, and converts them into commands.

Other new products, such as the *Kreyos Meteor smartwatch* offer gestural interfaces. The $95 watch connects over Bluetooth to an iPhone or an Android or Windows 8 phone. Users employ gestures, such as a hand wave, to answer an incoming call or have the watch – which has a three-axis gyroscope, accelerometer, and other internal sensors for detecting wrist motions – read a text message. Apple has developed a camera based system for its iOS 7 beta that lets users control their iPhones via gestures such as hand swipes or head movements. *Omek Interactive’s Grasp* which consists of middleware and a set of tools, processes data from 3D cameras and lets developers create hand- and finger-based tracking and gestural interfaces for applications and devices.

People who are disabled could use gestural interfaces to work with devices they could not otherwise operate. Vehicles represent another potentially successful application. Motions could control radios, windshield wipers, lights, and other types of equipment without users having to take their eyes off the road to look for knobs, buttons, or switches. Ford Motor Co. already has vehicles that open a rear hatch if drivers wave a foot underneath it. Gestural interfaces would let doctors or nurses control displays, computers, or other devices without touching them, said Leap Motion’s Zagorsek. This is an important factor in operating theaters or other medical settings in which personnel must maintain hand cleanliness, or in rooms in which some equipment is not within reach. Many facilities could also benefit from technology that would let workers control machinery and other devices they can’t reach.

*3. Match the words (1 – 8) with the words (a – e) to make collocations.*

1) to capture a) the signal

2) to disturb b) tracking

3) to cause c) gestures

4) to track d) wipers

5) hand e) hatch

6) finger-based f) swipes

7) windshield g) motion information

8) rear h) shifts

*4. Correct the technical mistakes in the following sentences.*

1. Leap Motion Controller uses two cameras and two infrared LEDs as light sources.

2. Omek Interactive’s Grasp consists of adware and a set of tools, processes data from 3D cameras and lets developers create gestural interfaces for applications and devices.

3.Kreyos Meteor smartwatch connects over LAN to an iPhone or an Android or Windows Vista phone.

4. Wi-Fi signals travel throughout a structure and require users to be in sight of the device they want to control.

5. WiSee University of Washington researchers have developed the WiSee gestural interface to control security systems.

#### 5. Read the text. Fill in the necessary prepositions, given below.

*Responsive*

We're used to instant reaction to physical manipulation of objects. After all, we're usually touching things that don't have a microprocessor and sensor that need to figure \_\_\_\_\_\_what's going \_\_\_\_\_. Thus, responsiveness is incredibly important. When engaged \_\_\_\_\_a gestural interface, users want to know that the system has heard and understood any commands given to it. This is where feedback comes in. Every action \_\_\_\_\_\_\_a human directed \_\_\_\_\_\_\_\_a gestural interface, no matter how slight, should be accompanied by some acknowledgment \_\_\_\_\_\_\_the action whenever possible and as rapidly as possible (100 ms or less is ideal as it will feel instantaneous). This can be tricky, as the responsiveness of the system is tied directly to the responsiveness of the system's sensors, and sensors that are too responsive can be even more irksome than those that are dull. Imagine if The Clapper picked \_\_\_\_\_\_every slight sound and turned the lights \_\_\_\_and \_\_\_\_, over and over again! But not having near-immediate feedback can cause errors, some of them potentially serious. \_\_\_\_\_\_any response, users will often repeat an action they just performed, such as pushing a button again. Obviously, this can cause problems, such as accidentally buying an item twice or, if the button was connected to dangerous machinery, injury or death. If a response to an action is going to take significant time (more than one second), feedback is required that lets the user know the system has heard the request and is doing something \_\_\_\_\_\_\_it. Progress bars are an excellent example \_\_\_\_\_\_\_responsive feedback: they don't decrease waiting time, but they make it seem as though they do. They're responsive.

*on, toward, out, by, on, off, up, of, without, about, with, of*

*GRAMMER: TO BE/GET USED TO*

We use ***used to*** with the infinitive (*used to do, used to go etc*) to say that something regularly happened in the past but no longer happens *(e.g. I* ***used to*** *play football when I was younger. I used to live in the country)*.

The question form is ***did you use to***? (*e.g.* ***Did*** *you* ***use to*** *live with your parents?*)

The negative form is ***didn’t use to*** *(e.g. He* ***didn’t use to*** *travel a lot when he was in college)*

We use ***to be used to doing*** something when we talk about situations that are familiar to us *(e.g. He* ***is used to living*** *alone).*

We use **get used to** when we talk about the process of becoming familiar with a new situation or action *(e.g. They* ***get used to*** *work at night).*

*1.a) Look at these examples and decide which situation describes an action which is becoming familiar; which is already familiar and the action that was true in the past.*

1. I used to play computer games in my childhood.

2. They are used to playing computer games.

3. They get used to making presentations.

b) *Write these sentences with be/get used to*

1. We instantly react to physical manipulation of objects.

2*.* They employ gestures, such as a hand wave, to answer an incoming call or have the watch – which has a three-axis gyroscope.

3. They can efficiently control office or household systems.

4. He had worked for five years as a system administrator.

5. Doctors can control displays, computers, or other devices without touching them.

*WRITING*

*Write an essay (80 – 120 words)* *about current trends in IT.*

**USEFUL LANGUAGE FOR TECHNICAL WRITING**

*e-mail, letters*

Dear Sir/Madam

I am writing to

I would be grateful if / Could you also

I am also delighted to inform you

Please, contact us

Thank you very much in advance

I look forward to hearing from you

Yours sincerely/Yours faithfully

*Application letter*

*Reason for writing*:

I am writing to apply for a position of / I read your advertisement in

I would be very interested in

*Personal profile*

I believe that I have the skills and good personal qualities, required for this job.

I am outgoing, sociable and energetic

*Education and training:*

I graduated in 2015 from the University of

I completed a course in

*Work experience:*

I am experienced in/I have 4 years experience in

I am currently working as

My duties include

*Skills and qualities:*

I have a basic knowledge of

I have strong skills in

I am fluent in English/French

I feel ready for

I would welcome the opportunity to

*Closing/availability for interview*

I enclose my curriculum vitae and references from my employers

I will be available for an interview at any time

I look forward to hearing from you.

Yours sincerely/ Yours faithfully

*Review*

Thank you for giving me the opportunity to

Firstly/To begin with, I’d like to talk about

Secondly, although,

Having said this, I must admit that

However/Thus

Furthermore/Moreover/In addition

I completely agree with

I am not sure that

In conclusion, I think it is very important that

*Technical incident report*

We regret to inform that

There was no sign of

The incident happened due to

It was identified that

It caused / It resulted in/ as a result of

Even if/otherwise

We recommend that

As soon as

We can rule out the things

*Product comparison report*

The purpose of this report is to compare… and to assist in

Both devices have

*X* is similar to

On the other hand

Instead of

*X* is the most appropriate for

However/Although

That depends on

While/whereas

Unlike/compared with

*Description of a device*

It is designed to/ it can be used for /it is mostly used for

It consists of/It includes

They are classified into

It is made of ….material

It is a type of

It works/operates

The best feature is

It not only… but

It uses

That is

It is expected that

**ABBREVIATIONS**

**AC** Accumulator

**AFM** Accounting and Financial Management

**AI** Artificial Intelligence

**ALU** Arithmetic Logic Unit

**ANN** Artificial Neural Network

**ANSI** American National Standards Institute

**BASIC** Beginner’s All-purpose Symbolic Instruction Code

**BOOMs** Binocular Omni Orientation Monitor

**BCI** Brain-Computer Interface

**CAD** Computer-Aided Design

**CAVEs** Cave Automatic Virtual Environments

**CCFL** Cold Cathode Fluorescent

**CCITT** International Telegraph and Telephone Consultative Committee

**CD** Compact Disc

**CDC** Control Data Corporation

**CD-I** Compact Disc Interactive

**CDROMs** Compact Disc–Read-Only Memory

**CE** Computer Electronics

**CF** Compact Flash

**CIR** Current Instruction Register

**COBOL** COmmon Business-Oriented Language

**CORBA** Common Object Request Broker Architecture

**CPU** Central Processing Unit

**CRM** Customer Relationship Management

**CRT** Cathode Ray Tube

**CSS** Collaboration Support System

**DEC** Digital Equipment Corporation

**DBMS** Database Management Systems

**DFD** Data Flow Diagram

**DRAM** Dynamic Random Access Memory

**DVD** Digital Versatile Disc or Digital Video Disc

**DVI** Digital Video Interactive

**ERP** Enterprise Resource Planning

**FORTRAN** FORmula TRANslation

**GHz** gigahertz

**GUI** graphical user interface

**HMD** Head-Mounted Display

**HRM**human resource management

**HTML** Hypertext Markup Language

**HTTP** Hypertext Transfer Protocol

**HTTP-S** Secure Hypertext Transport Protocol

**HVAC** Heating, Ventilating and Air Conditioning

**IBM** International Business Machines

**ID** Identification Data

**IDEs** Integrated Development Environments

**IE** Internet Explorer

**ILLIAC** Illinois Automatic Computer

**IP** Internet Protocol

**IPSec** Internet Protocol Security

**IS** Information Security

**ISO** International Standards Organization

**ISP** Internet Service Provider

**IT** Information Technology

**IVDs** Interactive Videodiscs

**JPEG** Joint Photographic Experts Groups

**J2WS** Java 2 Web Services

**KMS** Knowledge Management System

**LAN** Local Area Network

**LCD** Liquid Crystal Display

**LSI** Large-Scale Integration

**LED** Light Emitting Diode

**MAR** Memory Address Register

**MDR** Memory Data Register

**MMC** MultiMediaCard

**OOA** Object-Oriented Analysis

**OOD** Object-Oriented Design

**OOP** Object-Oriented Programming

**OS** operating system

**PC** Personal Computer

**PC** Program Counter

**PDA** Personal Digital Assistant

**PDP-1** Programmed Data Processor -1

**RAM** Random Access Memory

**RCA501** Radio Corporation of America 501

**RIP** Raster Image Processor

**ROM** Read-Only Memory

**RS** Recommended Standard

**SADT** Structured Analysis and Design Technique

**SAP** Systemanalyse und Programmentwicklung (eng. System Analysis and Program Development)

**SD** Secure-Digital

**SCM** Supply Chain Management

**SOAP** Simple Object Access Protocol

**SQL** Structured Query Language

**SRAM** Static Random Access Memory

**SSL** Secure Sockets Layer

**TCE** Trichloroethylene

**TCP/IP** Transmission Control Protocol / Internet Protocol

**TFT** Thin Film Transistor

**TLD** Top-Level Domain

**TLS** Transport Layer Security

**UNIVAC** UNIVersal Automatic Computer

**UP** Unified Process

**URL** Uniform Resource Locator

**VBScript** Visual Basic Script

**VPN** Virtual Private Network

**VLSI** Very Large Scale Integration

**VR** Virtual Reality

**WAN** Wide Area Network

**WWW** World Wide Web

**XML** eXtensible Markup Language

**XP** Extreme Programming

**PHRASAL VERBS**

back up резервувати, дублювати

break away розривати

break down зламати

break out вибухнути, спалахнути

carry out проводити, виконувати

check up перевіряти

clean out очистити

clean up прибрати

close down закрити

come up виникнути, підійти

cool down охолодити

cut out витіснити, вирізати

dry out повністю висушити

give off виділяти, випускати

give up відмовитися, покинути

find out дізнатися, з’ясувати

follow up слідувати

heat up нагрівати

keep down пригнічувати

keep up не змінювати, підтримувати

let in впускати, пропускати

let out випускати

pull back відтягувати, затримувати

push down натиснути, звалити

put off відкладати

put over перекласти на когось,на щось

put out виставити, гасити

roll out розгортати

run down розряджатися

set off запускати, починати

set up встановлювати

shut down закрити

speed up прискорювати

switch off виключити

switch on включити

take off знімати

take out виймати

turn down вимкнути, зменшити

turn on включити

turn off виключити

wear down зношувати

wear out зношувати, вичерпувати

work out опрацювати, розробити

**ENGLISH-UKRAINIAN GLOSSARY**

**A**

accept приймати, брати

access доступ

accomplish здійснювати, виконувати; завершувати

accountable підзвітний

accuracy точність

achieve досягнути

acquire  набувати, здобувати; досягати; опановувати

adapt адаптувати, пристосовувати

adjacent суміжний

adjustment регулювання

advent прихід, поява

adopt приймати

advantageous сприятливий, вигідний, корисний

affect впливати

agile швидкий, гнучкий, адаптивний

agility спритність, моторність

allocate розподіляти

allowдозволяти, давати згоду; робити можливим

alter змінювати(ся)

ambiguous двозначний; сумнівний; проблематичний

amount  кількість

amplify підсилювати

angle  кут

anticipate передбачати; очікувати

apparently  явно, очевидно

appear з’являтися

application застосування, використання;

прикладна програма

approach підхід

approximately приблизно, наближено

arbitrate вирішувати

array масив; сукупність, набір

artificial  штучний

arrangement розташування

argue  сперечатися, доводити

aspheric асферичний

assets  активи

assign  призначати

assist  допомагати

assume  вважати

assumption  припущення

astounding  вражаючий

attach (to)  підключати; прикріплювати,

додавати, приєднувати

attachment приєднання; пристосування

attempt намагання, спроба

attractive  привабливий

attribute приписувати; відносити

authentication автентифікація, перевірка істинності

authorized авторизований, дозволений

available  доступний, наявний

average середній; звичайний, нормальний

avoid уникнути

**B**

backbone  магістраль (мережі)

backup copy резервна копія

basics  основи

beneficial  вигідний

binary двійковий

breakthrough прорив

broadcast транслювати

boost підтримувати, підвищувати, підштовхувати

bulky великий; громіздкий

burn  записувати

button кнопка, клавіша

bus  шина

**C**

calculation обчислення, підрахунок

cancel  зупинити, скасувати

capacity ємність, об’єм

capture  захоплювати

carefully ретельно, обережно

carry out  здійснювати

catalyst каталізатор

courage  сміливість

causeбути причиною, заподіювати, викликати

cell клітинка; ділянка; сегмент

censorship цензура

character символ

checkout  контроль

circuit  схема

circumnavigate  об’їхати

claim вимагати; претендувати; стверджувати

clarity чистота, прозорість; ясність

collision зіткнення

combat боротися

commit  здійснити, доручати

compare порівнювати

comparison порівняння

compatible сумісний

complete закінчувати, завершувати

complicated  складний

competitive конкурентноспроможний

competitor  конкурент

complement доповнення

compression ущільнення, стиснення

concern  занепокоєння, стурбованість

concrete  бетон

confirm підтвердити

congestion  затор, скупченість, нагромадження

conscious свідомий

consecutive  послідовний

consequences  наслідки

consumption споживання; витрата

contaminate  забруднювати

contiguously поруч

convenience зручність; вигода

conventional  звичайний, традиційний

convert  перетворювати, конвертувати

convex  опуклий

convey  передавати

core  осердя, ядро

crash аварійна відмова, збій

create  створити

cumbersome громіздкий, обтяжливий

customer клієнт, замовник

customized software замовлене програмне забезпечення

**D**

damage  пошкодження

debug налагоджувати, виправляти помилки

deceive  обманювати

decompress розпаковувати (відкривати стиснутий файл)

decryption дешифрування, розшифровування

dedicated  відданий, присвячений

defence оборона, захист

defer відкладати, затримувати

define  визначати

delete видаляти, знищувати, стирати

deliver доставити

denote  позначати

density щільність; інтенсивність

deny  заперечувати

deploy застосовувати, запроваджувати

diseaseхвороба

dispersed  розсіяний

deserveзаслуговувати

desirable  бажаний; відповідний, придатний

destination призначення

defeat поразка

define  визначати

deprivation позбавлення

design  розробляти, проектувати

destined (for) призначений

device пристрій, прилад

digital  цифровий

disability нездатність; непрацездатність

discrete переривчастий, роздільний

disrupt  зривати

disruption порушення, відрив

distinct чіткий

disturbance хвилювання, пошкодження порушення

domain name доменне ім’я

dot крапка

download (to) завантажувати, пересилати

drawback перешкода; недолік

**E**

edit  редагувати

efficiency  ефективність, продуктивність

eliminate усувати; знищувати

embedded вбудований

emerge з’являтися, виникати

employee  службовець

employment  зайнятість

enable уможливлювати, дозволяти

enclose  укладати

encodeкодувати, шифрувати, зашифровувати

encourageзаохочувати, підтримувати

encryption шифрування

endeavor намагання

enhance  підвищувати

enormous великий

ensure  забезпечувати

entail спричиняти

entire  повний, цілий

entity сутність

equipment  обладнання

error помилка

escalate  загострювати

escape вилітати, втікати

essence сутність

essential суттєвий, необхідний

evaluate оцінювати

eventually  зрештою, нарешті; згодом

environment навколишнє середовище

exceed  перевищувати

exclude виключати

exclusively виключно

executable здійснений

execute виконувати

executive виконавчий

exist існувати

expand розширювати

expense витрати, рахунок

exposure виставляння, незахищеність

express виражати

extensive  широкий, далекосяжний

external зовнішній

eyestrain напруга для очей

**F**

facial  лицьовий, поверхневий

facilitate полегшувати, сприяти

facilities можливості, засоби, обладнання

fade знебарвлювати

failure невдача, провал

fair  чесний справедливий

fair  точно, ясно

fake підробка, фальшивка

feature ознака, характеристика

feedback зворотний зв'язок

fibre  волокно, тканина

fictitious вигаданий, уявний

fidelity відданість, точність

fingerprint відбиток пальця

flexible  гнучкий

focus on  зосередитись на

font  шрифт

forerunner попередник

fossil  викопний

fraud шахрайство

fraudulent шахрайський

frequency частота

frequent частотний

frustration розчарування

fund фінансувати

fuzzy нечіткий

**G**

gauge вимірювати, перевіряти; оцінювати

gateway шлюз

generate породжувати, генерувати

generation покоління

generic загальний, узагальнений

gesture жест

goggles захисні окуляри

grid сітка

**H**

hardware апаратне забезпечення

harsh  суворий, жорсткий

hazardous  ризикований, небезпечний

headphones навушники

headset навушники

host головний, основний

hot-swappable швидко замінний

huge великий

hydrogen  водень

**I**

illiteracy неграмотність

immerse занурювати, поглинати

immersion занурення

impact (on) впливати

impinge зазіхати, посягати

implement здійснювати, виконувати

improvement поліпшення, удосконалення

include включати

incorporate об’єднувати

inference (логічне) виведення

infrared  інфрачервоний

initial  початковий; первинний

injured пошкоджений, травмований

ink чорнило

insecure ненадійний

instantaneous миттєвий, негайний; одночасний

intend мати намір

intelligence інтелект

intercept перехоплювати

interlace переплітати; чергувати

interrelated взаємопов’язаний

iteration ітерація; повторення

internal внутрішній

intruder порушник

invade вторгнутися

invasive агресивний

investigate досліджувати

invisible невидимий

involve залучати, втягувати

integrity цілісність

iris райдужна оболонка

issue видавати, випускати

**J**

joints з’єднання, суглоби

jumpsuit  тренувальний костюм

**K**

key logger програма, яка перехоплює інформацію,

що вводиться з клавіатури

keystroke натискання клавіші

**L**

lack відсутність, нестача

launch запускати (комп’ютерну програму)

latency латентність, прихований стан

linkage з’єднання, зчеплення

longevity довговічність

loss втрата, збиток

**M**

maintain підтримувати

maintenance технічне обслуговування

malignant згубний, зловмисницький

manual ручний, неавтоматичний

match підходити (для чого-небудь)

measure вимірювати

medium засіб, спосіб

middleware програмне забезпечення проміжного шару

mileage кілометраж, відстань у милях

misalignment розгрупування

mount монтувати, установлювати

multiple множинний

multipurpose багатоцільовий, універсальний

**N**

navigateкерувати*,* пересуватися об’єктами Мережі

neural нейронний

node вузол

nonlinearнелінійний

nuclear ядерний

**O**

observe  спостерігати; стежити; додержуватись

obtain отримувати, діставати; досягати

obviously очевидно

occasion випадок, нагода

occur  траплятися, відбуватися

offer пропозиція, пропонувати

opaque непрозорий

original первинний;оригінальний; самобутній

overarching всеосяжний

overlap перекривати; частково співпадати, збігатися

overloaded перевантажений

overlay покриття, верхній шар

overwhelming незліченний; переважний

oxygen кисень

**P**

particular  специфічний, особливий; докладний

particle частка, крупинка

paste вставляти, вклеювати

(операція під час редагування тексту)

pattern зразок

payroll платіжна відомість

perform виконувати

performance продуктивність

pervasive поширюваний, проникаючий

pick up підбирати, підхопити

plagiarize займатися плагіатом

pointer вказівник

power енергія, потужність

precise точний

predetermine зумовлювати, вирішувати наперед

prescriptive розпорядчий; той, що наказує

pressure тиск

prevent запобігати

previously заздалегідь, раніше

process обробляти

processing обробка

profound глибокий, грунтовний

prior  колишній, попередній; вагомий

prohibit забороняти

protection захист

proponent прихильник, ініціатор пропозиції

property властивість; якість

provide забезпечувати

punched cards перфокарти

purchase покупка

purpose мета

**Q**

quality якість

quantity кількість

query language мова запитів

**R**

ramifications наслідки

random довільний, випадковий

range діапазон

rare рідкісний, незвичайний

rapidly швидко

rate рейтинг, оцінка

raw необроблений, сировина

recipient одержувач

recognition розпізнавання

rectangular прямокутний

reduce зменшувати, скорочувати

redundant надлишковий

refer (to) відноситись

refine  очищати; удосконалювати

reflect відображати

refresh оновлювати

reinforce посилювати

relate (to) відноситися

release випускати

reliability надійність

reliance довіра, упевненість, опора

remarkable видатний, чудовий

remote дистанційний, віддалений

removable змінний

renderer  той, хто оплачує; покупець, замовник

replicate копіювати, повторювати

representation представлення

research дослідження

resemble  походити, мати схожість

resiliency стійкість

require потребувати, вимагати

requirement вимога; необхідна умова

request запит

rescale змінювати масштаб

reside  перебувати, знаходитися

resolution дозвіл; роздільна здатність

resource ресурс

respond відповідати; реагувати

response відповідь

responsibility відповідальність

restrict обмежувати

resurgence відродження

retinal ретинальний

retrieveвідновлювати; витягувати

reveal розкривати

revenue  річний дохід

rigid жорсткий, негнучкий

roughly грубо, приблизно

**S**

safeguard захищати

sample зразок, вибірка

save зберігати, записувати

savvy кмітливість

scroll прокручувати

securities цінні папери

sensitive чутливий, секретний

separate відокремлювати

sequence  послідовність; порядок (проходження)

shortcomings недоліки

signature підпис

similar подібний

simplicity простота

simulate  моделювати, імітувати

simultaneously одночасно

single одиночний, окремий

skill  майстерність, уміння

software програмне забезпечення

solid-state твердотільний

solvent розчинник

sophisticated ускладнений, удосконалений

specification характеристика

specify  специфікувати; точно визначати

spoof підробити; розіграш

spreadsheet таблиця (eлектронна)

spyware шпигунське програмне забезпечення

stable стабільний, стійкий

stand-alone автономний

stagger вагатися, розхитувати

stock market фондова біржа

storage зберігання (інформації), пам'ять (зовнішня)

store зберігати

storyboard розкадрування

subdued приглушений

subject to  схильний до

submitted представлений

subscriber абонент, передплатник

subsequent наступний

sufficient достатній

suggest пропонувати

suite набір, комплект

supervise керувати, наглядати

supplier постачальник

supply постачати, пропозиція

support підтримка, підтримувати

surgery хірургія

survive вижити

suspicious підозрілий

**T**

techniques методи

temporarily тимчасово

theft крадіжка

threat загроза

throughput пропускна здатність

thumbwheel дисковий

tight щільний, напружений

transactionтрансакція

transparent прозорий

transmit передавати

treatment ставлення

tremendous величезний

typo типографічна помилка

**U**

ubiquitous всюдисущий

ultimate основний, останній

unabated невпинний

unambiguous недвозначний

unauthorised недозволений

undesirable небажаний

unique  неповторний; унікальний

unadvertised неоголошений

underemphasize недооцінити

unpredictable непередбачуваний

unsuspected непідозрюваний, несподіваний

unsolicited наданий добровільно

upgrade підвищувати якість

utilize використовувати

**V**

valid дійсний, чинний

validity вірність, чинність

valuable дорогий; цінний, корисний

value значення, вартість, величина, цінність

vapor випар

variety різноманітність

various  різноманітний

vast великий, широкий

vendorпродавець

velocity швидкість

verification перевірка, підтвердження

verify підтверджувати; контролювати; перевіряти

versatile гнучкий

victim жертва, потерпілий

view *v* переглядати

visual візуальний

vividly  яскраво; жваво; ясно

volatility енергозалежність

violation порушення

voltage напруга

vulnerable уразливий

**W**

wasteтратити

weight вага

well-being благополуччя, розквіт

width ширина; смуга

wind tunnels аеродинамічні труби

windshield лобове скло

wire дріт, провід

withstand протистояти, витримати; опиратися

white collar crime посадовий злочин

workability працездатність

**Y**

yield виробляти; поступатися

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