МИНИСТЕРСТВО ОБРАЗОВАНИЯ РЕСПУБЛИКИ БЕЛАРУСЬ
БРЕСТСКИЙ ГОСУДАРСТВЕННЫЙ ТЕХНИЧЕСКИЙ
УНИВЕРСИТЕТ

КАФЕДРА ИНОСТРАННЫХ ЯЗЫКОВ.

COMPUTER NOTIONS

ENGLISH READER FOR STUDENTS IN COMPUTER-RELATED FIELDS

Тексты для чтения на английском языке по специальности Т.10.01.00 и Т.10.03.00

Брест 2000

УДК 804.01-07

Содержит систематизированный лексический материал на английском языке в объёме около 100 текстов для развития навыков чтения литературы по специальности.

Для студентов первого курса специальностей «Автоматизированные системы обработки информации» и «Вычислительные системы и сети», продолжающих изучение английского языка в техническом ВУЗе после окончания средней школы.

Разработка одобрена на кафедре иностранных языков и рекомендована к изданию.

COMPUTER AND INFORMATION SCIENCE FUNDAMENTALS

TEXT 1

FROM THE HISTORY OF COMPUTING MACHINERY

The concept of using automatic machinery to perform computations is not a 20th century innovation. The humanity has come a long way to be where we are now in the computer technology. Here are some important dates from the chronology of the evolution of computing machinery.

The year 1642: The French philosopher and mathematician Blaise Pascal at the age of 19 designs a mechanical counting device capable of adding and subtracting.

The year 1671: Wilhelm Leibnitz, a well-known German philosopher, mathematician, physicist and linguist, develops an idea of a machine capable of performing multiplication, as well as addition and subtraction.

In 1833 Charles Babbage, an English inventor and mathematician designs his computing device, an analytical counting machine with design characteristics similar to those of the modern electronic computer to solve any arithmetic problem.

In 1887 P.L.Chebyshev, a famous Russian mathematician, constructs a computing machine and exhibits it in Paris. Four years later he invents an arithmometer capable of automatically performing multiplication and division.

Between 1937 and 1942 John Anastasoff and Clifford Berry from University of Pennsylvania (USA), develop the design concepts of the first electronic computer. They call it the ABC. Later on, John Mauchly and Presper Eckert expand these basic design concepts to produce the world's first full-scale electronic digital computer. They call it the ENIAC (Electronic Numerical Integrator and Calculator). It was a prototype of what we now call first generation computers.

TEXT 2

COMPUTER GENERATIONS

THE FIRST GENERATION OF COMPUTERS. First generation computers, based on vacuum tube technology, took up large amounts of space, used much amounts of power and were, for the most part, inefficient. So, the ENIAC model of the 40s weighed over 30 tons, occupied a space of 30 x 50 feet, contained 18000 vacuum tubes and used enough power to operate three 150 kilowatt radio stations. No wonder, that the cost of the early punchcard-oriented vacuum-tube computers of the first generation was in the millions.

THE SECOND GENERATION OF COMPUTERS. Second-generation computers used transistors instead of vacuum tubes. Transistor were introduced in the mid - 1950s. To most people the transistor meant small portable radios. But to those in the data processing business it meant more powerful, more reliable, more compact, less expensive and therefore more available to more organisations computers. However, these magnetic tape-oriented computers had limited compatibility and used low-level, symbolic programming languages.

THE THIRD GENERATION OF COMPUTERS. Integrated circuits (ICs), formed on a single chip of silicon with a density of 100,000 components per square inch, replaced transistors in third-generation computers. IC's did for the third generation what transistors had done for the second generation. The change was revolutionary, not evolutionary. Because of compactness, offered by this new technology, signals had less distance to travel. They allowed computers to perform millions of operations per second. A very important characteristic of third generation computers was upward compatibility and multiprogramming capability.

THE FOURTH GENERATION OF COMPUTERS Fourth generation computers are associated with the large and very large scale integration (more circuits per unit space) of electronic circuitry - LSI and VLSI technologies. A product of this microminiturization of electronic circuitry was the micro-processor developed in 1971. A microprocessor is basically a computer on a single silicon chip. The size and the cost of microprocessors have made mass production of small, relatively inexpensive but powerful microcomputers, also called personal computers, or PCs, a reality. In fact, they have made it possible for us to carry in a briefcase a computer with 40 times the power of the 30-ton ENIAC, the world's first-full-scale computer. And for less money!

WHAT'S NEW IN THE COMPUTER GENERATIONS ? The computer today is where the aeroplane was a year after the Wright brothers' history-making flight. With respect to the development and application of computer technology, we have only just begun.

TEXT 3

GENERATIONS OF PROGRAMMING LANGUAGES

The progress in computer technology brought about by the ENIAK would be greater if it were not for the time-consuming method of programming the machine. In THE FIRST GENERATION of languages programs were written in machine languages and consisted entirely of series of 1s and 0s. As you might expect, machine-language programs were extremely long and difficult to write. Early programmers had no alternatives. Fortunately, we do.

THE SECOND GENERATION language, called ASSEMBLER language, used symbols to represent a series of 1s and 0s, speeding up the process of coding a program. As the machine and assembler languages require the programmer to write programs at the most basic level of operation, i. e. with an instruction for each operation to be performed, they are collectively called LOW- LEVEL languages, as opposed to HIGH LEVEL languages (third through sixth generations) in which most of the programming is now eventually done, and in which each instruction normally involves a number of combined operations to be performed by the computer.

THE THIRD GENERATION languages. The process of coding a program was further speeded up with the third generation languages due to their procedure-oriented nature. It allowed the programmer to write instructions that combined a number of computer operations. Procedure-oriented languages are usually classified as scientific, business, or multi-purpose. Since most applications for early computers were scientific, the first procedure - oriented language, FORTRAN, developed in 1955, had the aim of making it easier for scientists and engineers to write programs. A few years later, in 1959, COBOL was introduced for business applications, followed by BASIC and PASCAL in 1965 and 1968, respectively.

In **THE FOURTH GENERATION** languages, first introduced in the late 1970s, as well as in the fifth and sixth generations, we need only instruct the computer system " what to do ", and not necessarily " how to do ", whereas while programming in one of the first three generations of languages, you have to tell the computer not only " what to do " but necessarily how to do it as well.

Researchers are currently working to develop pure natural languages that will permit an unrestricted dialogue between us and a computer. In the meantime, natural languages with certain syntax restrictions are available. And for limited information processing tasks existing natural languages permit users to express queries in normal everyday English. You can phrase a query any way you want. If your query is unclear, the natural language software might ask you questions that will clarify any ambiguities.

TEXT 4

HOW MANY TYPES OF COMPUTERS ARE THERE?

DEFINITION. Technically speaking, the computer is any counting device. However, in the context of modern counting devices we can define the computer as an electronic device capable of interpreting and executing programmed commands for input, output, computation and logic operations.

FACTORS THAT MAKE COMPUTERS DIFFER FROM EACH OTHER. From the first digital computers of 1940's and to today's powerful full-

size computers and revolutionary microcomputers very little change has occurred in the basic principles of computer operation: all computers, no matter how large or small, old or new, still work with 1s and 0s (or otherwise binary digits, called bits), using the same basic logic operations. Nevertheless, there are several factors that make computers different from each other. These factors are physical size, cost, speed, memory capacity, word size, and the number of remote workstations the computer can service. When these factors are used to compare computers, we can generally classify them into three categories: microcomputers, minicomputers and mainframes (maxicomputers).

MICROCOMPUTERS. This newest member of the computer family is also the smallest and least expensive. Its small size and minimal cost are result of the LSI and VLSI technologies. Perhaps the best definition of a micro is "any computer that you can pick up and carry". A microcomputer is also called a personal computer or PC. Personal computers come in three different physical sizes: pocket PCs, lap PCs, and desktop PCs. A typical mC can execute 250 000 instructions per second and can normally handle word size up to 16 bits. Microcomputers are primarily designed for small business applications and for hobbyist or for domestic use.

MINICOMPUTERS. These are much larger, more expensive and several times faster than microcomputers. At the same time, they are much smaller, less expensive and several times slower than mainframes. A minicomputer and its peripheral equipment can usually fill a small room (you can pick up and carry a micro, but not a mini). Typically, minicomputers can execute about 1 million instructions per second and handle word sizes from 12 to 32 bits. They are common in small businesses (ten to 400 employees), industrial process control, data collection, scientific research groups, engineering firms, and colleges.

MAINFRAMES. These "maxicomputers" are the largest, most powerful, and most expensive computers. They are found in large corporations, banks, universities, and large scientific laboratories. Mainframes usually fill a large room because they include many types of peripheral equipment. A typical mainframe can execute 5 million instructions per second, while the most powerful of them can perform up to one billion instructions per second and can service over 10,000 remote workstations. The most common word sizes they can handle range from 32 to 64 bits. Thus, mainframes work faster and handle more data at one time than minis and micros do. This makes them more powerful.

TEXT 5

A. BASIC COMPUTER STRUCTURE

Despite the differences in performance among the various types of computers, every computer contains five basic units: the Memory Unit, Arithmetic / Logic Unit (ALU), Input Unit, Output Unit and Control Unit.

The **Memory Unit** stores groups of bits (words) that represent instructions that the computer is to execute (that is a program), and data that are to be operated on by the program. The memory also serves as the temporary storage of the results of operations performed by the ALU. The Memory Unit's operation is controlled by the Control Unit, which signals for either a Read or a Write operation and provides the propitiate memory address. Data that are to be written into the memory can come from the ALU or the Input Unit, again under the control of the Control Unit. Data that are read from the memory can be sent to the ALU or the Output Unit. As is known, a computer has both internal memory and external mass memory. Internal memory is relatively low-capacity, high speed memory that stores programs and data that the computer is currently executing (that is short-term storage). Semiconductor RAM and ROM are commonly used for internal memory. External memory is high-capacity, relatively low-speed memory that is used to store programs and data when they are not being used by the computer (that is long-term storage). Magnetic tape and disk are the most common types of external mass memory.

The **ALU** performs arithmetic and logic operations on data. The Control Unit sends signals to the ALU that determine which operation is to be performed on the data. The Control Unit also determines the source of the data as the Memory Unit or the Input Unit. The results of the operations can be sent to memory for storage or to the Output Unit. Remember that the ACCUMULATOR is a register that participates in most of the operations performed by the ALU, and it receives the results of most ALU operations.

The **Input Unit** consists of devices that allow data and information from the outside world to be entered into the computer's internal memory or ALU. These devices are often referred to as PERIPHERALS because they are physically separated from the electronics that make up the «brain» of the computer.

The **Output Unit** consists of peripheral devices that transfer data and information from the internal memory or ALU to the outside world. Typical output peripherals include LED displays, printers, teletypewriters, videomonitors or TV receivers, etc. Disk memory units can also be considered output peripherals; data and programs from internal memory are often outputted to these external memory devices for long-term storage. When a keyboard input device is combined with a visual output device, such as a printer or video monitor, the combination is commonly

called a video display terminal (VDT). A microcomputer usually has only one terminal, whereas most mainframes and many microcomputers have several terminals, each of each can act as input to or output from the computer.

The function of the **Control Unit** should now be obvious. It directs the operation of all the other parts of the computer by providing timing and control signals. It is like the orchestra conductor who is responsible for keeping each of the instruments in proper synchronisation. The Control Unit contains logic and timing circuits that generate the signals needed to execute each instruction in a program. The Control Unit fetches an instruction from memory by sending an address and Read command to the Memory Unit. The instruction word comes from the memory into the Control Unit.

This instruction word, which is in binary code, is then decoded by logic circuits in the Control Unit to determine which operation is to be executed. Once this is determined, the Control Unit generates the signals needed to execute the operation. Thus we can say that the Control Unit's function is to fetch, decode and execute the instructions that are in memory (that is, the program). So, we see that the Control Unit performs these same steps over and over as long as the computer is operating.

The ALU and Control Units are usually combined into a single unit called the **Central Processing Unit** (CPU).

B. BASIC COMPUTER SYSTEM STRUCTURE

A computer system contains HARDWARE, SOFTWARE, and FIRMWARE. The **hardware** refers to the electronic, mechanical and magnetic devices that physically make up the computer. The amount of hardware varies widely from small microcomputers to large mainframes, but one thing is the same for all computers: the hardware is useless without a program or programs in memory. **Software** refers to the programs that direct all the activities of the computer system from start-up to shut-down. All software falls into one of two categories: applications software or systems software. Applications software is used for specific tasks, such as performing statistical analyses, controlling industrial processes, and producing video games. Systems software is more general than applications software. It supports all applications software by directing the basic functions of the computer. For example, systems software controls the initialisation process that the computers follow when it is turned on.

Another example is the systems software that allows us to enter programs in a language such as BASIC. All software has to reside in the computer's internal memory unit when it is to be executed. Typically, the software is loaded into internal memory from external memory, such as tape or disk. When a program is in

ROM, it is often referred to as **firmware**, because it is always there. A familiar example of firmware is the video game ROM cartridge.

TEXT 6

THE KEYBOARD UNIT

The keyboard unit has 101 (or 83) keys. When a key is pressed for longer than half a second, it will repeat automatically at the speed of about 15 characters per second. The keyboard is divided into the following sections:

1) The typewriter key area;
2) The function keys;
3) The numeric keypad;
4) Multi-key commands.

There are three status lights on the top of the right hand corner of the keyboard to indicate the status of the Caps Lock, Num Lock and Scroll Lock keys.

The keyboard internally has a 16 bytes buffer. While a program is running you can type up to 16 characters, including the Enter key, to be stored in the buffer. When the program has been executed, the characters that are typed in will be immediately displayed on the screen. If you have already pressed the Enter key, the command will be executed.

The buffer has several advantages. No matter how fast you type, or when a command is entered, the characters will be stored temporarily in the buffer until the microprocessor is ready for processing, and no character will be lost. You don't need to wait until the computer system has completed executing a command before typing in the next command. Typing more than 16 characters will cause a beep, which signifies that these characters will be not processed.

TEXT 7

WINCHESTER DISKS

Winchester disks or hard disks, are considerably different from floppy disks. First, they are more expensive than floppies, and they ordinarily cannot be removed from the inside of the processing unit.

The nonremovable hard disk offers greater storage capacity and faster access time. A small hard disk can store 3 million bytes or 3 megabytes (MB), equivalent to about 2 500 written pages. Compare that to a floppy disk's range 160,000 to 830,000 bytes which equals 80 to 320 pages. Data can be read from a hard disk to the computer or written from the computer to the hard disk approximately 20 times faster than with a floppy.

Its access head is much closer than a floppy's to the disk surface. The hard disk is not flexible, and usually it is not removable, so it isn't ordinarily exposed to

damaging environments or foreign objects, such as dust. Consequently, a hard disk can be engineered to greater precision than a floppy disk. The closer location of the head means access speed can be more rapid because data can be packed more tightly on the disk.

In summary, for applications that require a lot of storage, quick access to data, and/or switching back and forth among files, a hard disk is the faster, more reliable alternative.

A hard disk consists of an aluminium disk or plate covered with a thin iron-oxide coating. Its read/write head hovers about 20 micro-inches above the disk surface as it rotates at about 3300 to 3600 revolutions per minute. The read/write head creates and reads magnetic fields on the surface of the disk.

Each track on a hard disk starts at one particular radius, called the index position. From here a track is divided into equal arcs, or sectors, which is the smallest unit of data a disk catalogues and retrieves. There are usually 32 sectors of 250 bytes each or 16 sectors of 312 bytes each.

A hard disk must be formatted before it can be used. This means that the controller for the hard disk creates a set of track/sector addresses by marking tracks and sector boundaries on the disk and storing the information in a data dictionary of the disk itself.

When the computer issues a request for data, the disk controller checks the data dictionary to see where the data are located. The dictionary specifies the track and sector where the data begin and tells how many tracks and sectors the data are stored on. Then the head actuator moves the head to the proper track to start reading the data.

The process of writing data to a disk is similar. The data dictionary specifies the tracks and sectors available for receiving data. When called upon to write data to the disk, the controller checks the dictionary for a large enough area and then moves the head to the proper track. The controller also enters the newly written data's names and address in the disk's data dictionary.

Hard disks can be fixed or removable. A fixed hard disk is permanently seated into a compartment along with its read/write heads. The sealed environment prevents contamination from dust particles and grease. Removable hard disk cartridges are housed in an airtight plastic container, which also helps to prevent contamination. The read/write heads gain access to the disk through a door that slides open only when the cartridge is latched into the drive.

TEXT 8

PROGRAMMING

Programming is the process by which a set of instructions is produced for a computer to make it perform a specified activity. The main steps which have to be covered before a program is completed are:

1. Understand the problem, and plan the solution.
2. Prepare a FLOWCHART or DECISION TABLE of the problem.
3. Prepare the instructions in coded form.
4. Test the program until it is performing correctly.
5. Prepare detailed documentation of the program and instructions on its operation.

Step 1. Understanding the problem is of fundamental importance. Depending on the complexity of the problem, the capacity of the computer and the type of language to be used, the program may be written as a single entity or divided into segments, each one covering a logically distinct part of the problem. Programmers have shown time and again that it takes less time to code, as a rule, say, ten 50-line modules that it does to code a single 500-line program.

So, the first step in designing a program is to break the programming problem into a hierarchy of tasks. A task can be broken into subtasks. The way to the most effective programs is to design them so they can be written in modules, or independent tasks.

Step 2. Flowcharting the problem is the next step to be performed. The object of flowcharting is to produce a diagram showing the logical relationship between the various parts of the program. A flowchart will normally be independent of the type of computer to be used or the language the program is written in, although these factors must be borne in mind.

Step 3. Coding the program follows the completion of flowcharts. The logical steps described in the flowchart are translated into instructions to the computer. These instructions will be either in MACHINE CODE, or in some form of SYMBOLIC LANGUAGE. The choice of language will depend on the complexity of the problem and the capacity and resources of the computer to be used. Whatever language is used to write a program, the programmer must achieve the same basic end; to reproduce the logic of the program as shown in the flowchart as simply, economically and efficiently as possible.

Step 4. It is most unusual for a program to work correctly the first time it is tested. Errors in programs are known as BUGS, and the process of correcting these errors is described as DEBUGGING. Errors are of two main types: errors due to incorrect use of the programming language and errors due to incorrect logic in the

solution of the problem. Programs are tested with samples of the data normally expected to be input to the program and the results obtained compared with calculated results obtained manually from these test data. When the results obtained by the program match up to the expected results, and the programmer or the systems analyst is satisfied that all possible conditions have been simulated, the program may be said to be working correctly.

Step 5. However, a correct program is of little use unless it is supported by full DOCUMENTATION. Documentation of the program is designed to fulfil two functions: to enable a user to operate the program correctly, and to enable another person to understand the program so that it may, if necessary, be modified or corrected by someone other than the programmer who first wrote it. Operating instructions include the following elements: a program description; set-up; running procedure; output disposal. Program documentation will include details of the program specification, flowcharts, coding and any COMPILATION listings, and test results.

Conclusion. Programming can be enormously frustrating, especially at first. Don't despair ! Just when you think that the task confronting you is impossible, a little light will turn on and open the door to the joy of learning to program. That light has turned millions of people on to programming, and it will turn you on, too.

TEXT 9

A. COMPUTERS WORKING TOGETHER

Some centralised computer centres have grown so big and complex that have lost their ability to be responsive to the organisation's information needs. This lack of responsiveness was a major factor in reversing the trend from centralisation to decentralisation or DISTRIBUTED PROCESSING.

Distributed processing is both a technological and organisational concept. Its premise is that information processing can be more effective if computer hardware (usually micros and minis), data, software, and in some cases, personnel are moved physically closer to the people who use these resources. They don't need to go to the information services department for every request.

In distributed processing, computer systems are arranged in a COMPUTER NETWORK, with each system connected to one or more other systems. A distributed processing network of computer systems is usually designed around a combination of geographical and functional considerations.

B. COMPUTER NETWORKS AND CONFIGURATIONS

Each time you use the telephone, you use the world's largest computer network - the telephone system. A telephone is an end point , or a node, that is con-

nected to a network of computers that route your voice signals to another telephone, or node. The node in a computer network can be a workstation or another computer. Computer networks are configured to meet the specific requirements of an organisation. The basic computer network configurations are star, ring, and bus.

The STAR configuration involves a centralised host computer that is connected to a number of smaller computer systems. The smaller computer systems communicate with one another through the host and usually share the host computer's data base. Both the central computer and the distributed computer systems are connected to workstation (micros or VDTs). Any workstation can communicate with any other workstation in the network. Banks usually have a large home-office computer system with a star network of minicomputer systems in the branch banks.

The RING configuration involves computer systems that are approximately the same size, and no computer system is the focal point of the network. Each intermediate computer system must read a message and pass it along to the destination computer system.

The BUS configuration permits the connection of workstations, peripheral devices, and microcomputers along a central cable. Devices can be easily added to or deleted from the network. Bus configurations are most appropriate when the devices linked are close to one another. A pure form of any of these three configurations is seldom found in practice. Most computer networks are hybrids - that is, combinations of these configurations.

C. LOCAL NETWORKS

A local area network (LAN), or a local net, for short, is a system of hardware, software, and communication channels that connects devices on the same premises, such as a college campus or a cluster of office buildings. A local net permits the movement of data (including text, voice, and graphic images) between mainframe computers, personal computers, workstations, I/O devices, and even data PBXs. For example, your micro can be connected to another micro, to mainframes, and to shared resources, such as printers and disk storage. The distance separating devices in the local net may be a few feet to a few miles.

The unique feature of local nets is that a common carrier is not required to transmit data between computers, workstation, and shared resources. Because of the proximity of devices in local nets, a company can install its own communication channels (such as cable or optical fiber).

Like computers, cars, and just about everything else, local nets can be built at various levels of sophistication. At the most basic level they permit the interconnection of PCs in a department so that users can send messages to one another

and share files and printers. The more sophisticated local nets permit the interconnection of mainframes, micros and the gamut of peripheral devices through a large, but geographically constrained area, such as a cluster of buildings.

In the near future, we shall be able to plug a workstation into a communication channel just as we would plug a telephone line into a telephone jack.

Local nets are often integrated with «long-haul» networks. For example, a bank will have home-office teller workstations linked to the central computer via a local net. But for long-haul data communication, the bank's branch offices must rely on common carriers.

TEXT 10

A. COMPUTER USERS

One of the most important trends in computer use has been the increase in the number and kinds of people using computers. At first only engineers and computer professionals used computers. Later, with the development of on-line distributed systems, clerks and sales people learned to use computer terminals for data input and inquiry. More recently still, individuals in their homes, and professionals such as doctors, lawyers, and managers, have begun to use computers for a variety of purposes.

Not only has this trend caused major changes in the opportunities and career paths of computer professionals, but it has also affected the work lives of nearly everybody else.

The uses of computers can be classified into six general categories:

INFORMATION SYSTEMS /DATA PROCESSING - the computer is used to process data and produce business information.

PERSONAL COMPUTING - the computer is used for a variety of business and domestic «personal» applications.

SCIENCE AND RESEARCH - the computer is used as a tool in experimentation and design.

PROCESS CONTROL - the computer is used to control a process by accepting and evaluating data in a continuous feedback loop.

EDUCATION - the computer is used to communicate with a student for the purpose of enhancing the learning process.

ARTIFICIAL INTELLIGENCE - the computer is used in application that simulate such human capabilities as teaching, speaking, drawing, spelling, and the abilities to reason, learn, and to strive for self-improvement.

B.COMPUTER SPECIALISTS IN THE USER AREAS

As computers continue to spread into every corner of human society, the number of jobs for individuals with computer skills and knowledge will grow. The field is changing rapidly, however, and skills which were in demand yesterday are no longer in demand today. Yet the kinds of jobs now available are more challenging and more stimulating than many of those available in the past. Thus, the computer field will continue to attract ever more and more highly-skilled people.

COMPUTER NOTIONS

VOCABULARY REVIEW

Test 1.

1) The history of computers is a history of changing technology. The first computer used vacuum tubes. In the 1950s cheaper and smaller circuits were made using transistors. The current technology, integrated circuits, is even smaller and cheaper.
2) Second generation computers were made up of solid-state transistors.
3) Distributed computer systems consist of hardware, software, personnel, and communication channels.
4) Programs comprise groups of instructions.
5) Inputting data and making requests for changes make up users group activities.
6) Communications equipment is composed of cables, modems, and controllers.
7) Just as the processing cycle is divided into three stages, computer hardware is divided into input, processing, and output devices. The heart of a computer system is called CPU.
8) Twenty years ago, the computer system consisted of hardware, software, and personnel.
9) Operating the computer and writing new programs constitutes the major part of systems group activities.
10) With the development of data communications networks, the computer and communications industries are becoming more and more similar. Many communications companies are offering computers, and many computer firms are offering communications devices and services.

Test 2.

1) The function of the systems groups is to design and operate the system.
2) Modems are used for translating computer signals into phone signals.

3) Communications equipment is used to connect hardware users into a network.
4) A communications controller controls the sending and receiving of data.
5) The keyboard terminal is used for inputting data.
6) One of the most important trends in computer use has been the increase in the number and kinds of people using computers.
7) This device is divided into three parts: control, logic, and memory. With regard to output, common output devices include terminals and printers.
8) For average buyers, ease of use should be the main consideration in selecting hardware and software.
9) Eventually computers will become much easier to use than they are now. Computers will be able to see, to speak and to understand natural languages. Research is currently going on to develop such fifth generation computers.
10) All computers, whether large or small, go through three steps in transforming data. In the input phase the information is loaded into the computer. During the processing phase the information is changed somehow; for example, two numbers are added, subtracted, or compared. During the output phase the result is sent to the computer users.

Test 3.

1) The CPU can be divided into three parts: the logic, memory, and control units.
2) A system's memory can be classified into primary and secondary storage.
3) There are several types of on-line hardware, such as terminals and disk drivers.
4) Cables are used to carry data.
5) First generation circuits were made up of vacuum tubes.
6) There are three categories of computers: mainframes, minis, and micros.
7) General-purpose and special-purpose computers are two kinds of computers.
8) Because of the change in technology, today's small computers, called microcomputers are as powerful as the big computers of the 1950s. The biggest computers, called mainframes, are even more powerful and versatile than before, as is the next largest class of computers, minicomputers.
9) In addition to its devices for input, processing, and output, a computer system usually contains secondary storage devices. Primary storage is contained in the CPU, but it is usually not adequate to handle the information needs of the system. Disk drives are the most commonly used devices for this function.

10) In choosing a personal computer, hardware is not as important as software. Buyers should first decide what they want to do with the computer and then determine what applications software they will need. After that, they can choose a machine which will run this software.

Test 4.

1) Microcomputers differ from mainframes in that they are much smaller and cheaper.
2) Mainframes are general-purpose machines, whereas minicomputers are often specialised machines for scientific and engineering purposes.
3) Distributed systems differ from centralised systems in that distributed systems require communications equipment.
4) Printers and monitors are kinds of output devices.
5) Line printers differ from graphics printers in that line printers print typewriter characters, and graphics printers draw pictures.
6) Secondary memory is cheaper but slower than main memory.
7) If buyers are professional computer users and plan to do their own programming, they may also be interested in whether a computer can use certain systems software.
8) In order to operate, a computer also needs software or programs. In the future artificial intelligence will make it easier and quicker to use computers.
9) Computer communications is a direct challenge not only to telephone companies but also to other forms of communication.
10) Over the past two decades, as the price of computing has plunged, the personal computer enabled people to be more productive and gain better access to information.

Test 5.

1) Software can be broadly classified into that which aids a programmer (systems software) and that which aids users (applications software). Systems software includes operating systems, programming languages, and specialised programming systems; applications programs involve programs which answer questions for user.
2) Assembly language consisted only of a few commands and mathematical operations. It was hard to learn and easy to make mistakes. Later languages were closer to English, and hence easier to learn and use.
3) An operating system takes care of the needs of the user by searching for data and programs when needed and storing them when not needed.
4) The user of the system, a human being, communicates through a programming language, which resembles to some extent his own natural language.

The machine, however, understands only 0's and 1's and hence must have the programming language translated for it.

5) It is important to develop powerful, easy-to-use programming languages due to increasing cost of hiring programmers.
6) Data processing involves manipulation of numbers, whereas information processing includes applications, which deal with words and pictures.
7) Office automation includes the use of computers for word processing, for making decisions, and for graphics.
8) A computer professional must be well aware of the computer hardware, software, and firmware.
9) Engineers use computers to aid the design process.
10) A robot is a computer-controlled machine that can do jobs like welding, painting, and moving heavy pieces of metal. It is often used to do dirty and boring jobs that people don't want to do. Some robots can even see, while others have a sense of touch, opening other possible uses to robots.

Test 6.

1) Both COBOL and FORTRAN are still widely used specialised programming languages.
2) The difference between COBOL and FORTRAN is that COBOL is used for business applications and FORTRAN is used for scientific applications.
3) A number of files can be stored on a single disquette. Every file that is stored on the same disquette must have a unique file-name. In other words, no two files on the same disquette can have the same filename.
4) Operating systems are different from programming languages in that operating system is portable.
5) While the hardware manufacturer writes operating systems and programming languages, software houses and other programming professionals write applications programs.
6) On the one hand, highly trained programmers use programming languages. On the other hand, ordinary people in business organisations use applications programs.
7) Although LISP is fairly old language (1961), it is very popular with researchers in artificial intelligence.
8) The new 21-inch colour monitor, intended for creating professional graphics, meets the most strigent demands of ergonomics.
9) Contemporary computers employ serial processing while fifth generation computers are expected to use parallel processing.

10) The main reason for the onset of most muscular pains when working with computers is that many computer users adopt incorrect positions. However, no ideal position may be kept for a long time. So stand up every hour and take a break. Allow your body to move, walk a few steps regularly.

Test 7.

1) Both personal computers and minicomputers are expected to gain market share in the near future.
2) Whereas personal computers tripled their market share between 1992 and 1997, minicomputers increased their market share by only 15%.
3) While the market share of personal computers increased dramatically during this period, that of mainframes decreased drastically.
4) Mainframes, like small business computers, word processors, and terminals, have experienced a loss of market share lately/recently.
5) Although personal computers greatly increased their market share, terminals and word processors had slight losses.
6) When the telephone was new more than a century ago, people didn't know quite what to make of it. "What is it good for?" – they used to ask.
7) This technical solution has several advantages.
8) Nobody is surprised today to hear that the personal computer has turned into a powerful instrument.
9) A survey has shown that more than half of the United States' 1999 sales of personal computers was for home use.
10) The main factors, which contribute to muscular pains, are the incorrect posture adopted by many computer users, non-ergonomic arrangement of the work area, and the problems associated with the keyboard.

Test 8.

1) By 1983, the smaller minicomputer manufacturers were changing their original strategies. This was due to the fact that growth in the minicomputer market was slowing because competition from powerful, inexpensive microcomputers was growing.
2) Osborne Computer was among the most successful computer companies in the early 1980s. There were two reasons for this. First of all, it was the first to offer consumers a complete personal computer system (including soft ware) at a price under $2000. Secondly, it was the first to offer a portable (or transportable) computer. As a result, in 1982 it shipped nearly 100,000 computers.
3) In 1983, Osborne came close to bankruptcy; it laid off all of it production employees and closed its two assembly plants. This was due to the fact that

it had made several mistakes. For instance, it had announced its new products before it was ready to produce them, and as a result, consumers lost interest in its old products. Also it had probably priced its new computers too high. Since it faced increased competition from companies such as Kaypro and Compaq, it could not afford to make such mistakes.

4) Originally the Tandy Company sold its personal computers through the Radio Shack stores. As a result it had an image problem when it tried to sell to large corporations. This was also due to the fact that in their dull silver plastic cases, Tandy's computers did not look like serious office equipment.
5) In the first six months of 1983, three of the major home computer manufactures — Atari, Texas Instrument, and Mattel — all lost millions of dollars. Commodore was the only home computer make to earn a profit since it had automated its production facilities and was able to reduce costs as prices of home computers dropped.
6) The sending of information from one computer to another is accomplished in a number of ways. The primary method, of course, is over the phone system. The drawback to the phone system is that currently the phone system uses a different kind of signals than computers do. Computers use digital signals, while the phone system uses analog signals. Thus, to use the phone system, you currently need a modem to translate the signals from one system to the other. Eventually, however, the phone system will be digital as well.
7) The spread of computer communications has caused a good deal of uneasiness. One key area of concern is computer security. For instance, people are afraid that the wrong people might use a computer to get into their bank account or credit file. The advantages of having up-to-data information, however, will probably outweigh these fears.
8) The excellent image quality coupled with an aggressive price of $799 will ensure high demand for this product.
9) The expansion of production has made it possible to sharply lower the initial prices and thereby increase demand.
10) We may get to the point where all our employees have a portable computer, along with a desktop machine, so they can take work home or on the road.

Test 9.

1) The fast-growing field of computer communications works to link computers and users into various kinds of networks.

2) Computer networks are of two types: large-scale, involving telephone lines, microwave links, or satellite connection, and local, involving coaxial cables or optical fibers.
3) It is predicted that this will lead to future growth of home computer sales, and that such computers will be powerful, versatile, and commonplace for people everywhere.
4) Documentation has become such a chaotic, expensive and confusing aspect of computer use that many users no longer bother consulting the manuals except as a last alternative.
5) Owners of Pcs who have a modem can use a telephone system to gather information. They can also use their Pcs to send mail electronically.
6) Security involves keeping key programs and data safe from change and/or viewing. It is important because millions of dollars may be lost if the system does not have adequate safeguards, such as passwords.
7) Compatibility is the ability of machines to run the same program or communicate with one another. This is a particular challenge because different companies produce computers that are incompatible.
8) Besides the phone system, there is other transmission media. For local networks, for instance, the preferred medium is coaxial cable. As it becomes less expensive, however, optical fibers will replace coaxial cable because it is faster and can carry a greater volume of information. For longer distance communications microwave and satellites are used.
9) Today, any person who lays claims of being a professional in any technical sphere must be computer -literate.
10) The development period, when equipment was chosen on the «give-me-something-simpler» principle has evidently gone, never to return. More and more often today buyers/customers demand only the latest and technically most perfect.

Test 10.

1) This is due to the changes and improvements that have been made in the basic components of computer system.
2) First generation vacuum-tube computers were large and expensive to make; the improved second generation transistor-based computers where smaller and easier to make; third generation computers used integrated circuits, which were even smaller, less expensive, and more reliable than earlier technologies.
3) Hardware consists of the mechanical and electronic parts of the system such as terminals, central processing units, and printers, whereas software con-

sists of the programs that give the computer its instructions. The system follows the instructions of the software to process information.

4) A program is a step-by-step series of instructions used by the system to process information. Without a program, the computer is useless; it is the program which gives the computer its instructions.
5) Special-purpose computers, which can do only one kind of job, are more limited in their usage than general-purpose computers. General-purpose computers are more common.
6) In today's world, users and machinery of computer systems are often spread over a large area. Thus, communications equipment is essential for connecting the two into an well-organised system.
7) Two types of storage are used in computer systems — core storage and secondary storage. Core storage, or memory, is located in the CPU; it holds data and programs needed by the system when it is operating. Secondary storage, which is storage of data on disk drives, is used to increase the memory capacity of the system. Core storage is faster but more expensive than secondary storage.
8) The number and kinds of people using computers has increased greatly in recent years. The reasons for this are primarily economic; hardware costs have fallen rapidly while labour costs have risen.
9) The systems consultant helps organisations choose appropriate hardware and software.
10) Ergonomic studies the relationship between people and machines, and has led to the development of computer systems, which are more comfortable as well as easier to use.

SUPPLEMENTARY READING

TEXT 1

FROM DIRT TO DATA

Two centuries ago, 90 of every 100 people worked to produce food. As people became more efficient in the production of food, an agrarian society gave way to the growth of an industrial society. Today, two people produce enough food for the other 98, and the industrial society is making way for an emerging information society.

The trend in today's factories is paralleling that of the farm 200 years earlier. If history repeats itself - and most experts believe it will - automation will continue to reduce the number of workers needed to produce manufactured goods. And

sometime in the near future, our industrial society will mature into an information society.

In the information society, workers will concentrate their energy on providing a myriad of information services. Grocery shopping will be done from the comfort of our own homes. When diagnosing a patient, physicians will routinely ask for a second opinion - from the computer, of course. National elections and referenda will be completed in minutes. Some factories will have no windows or light - robots don't need to see.

TEXT 2

A MILESTONE IN HISTORY

The year 1982 was filled with notable events, people, and situations. However, when TIME magazine made their annual selection for Man of the Year, they chose a machine: the computer.

The Man of the Year is someone or something that has had the greatest influence, be it good or evil, during the year. TIME editors chose the computer because they felt it would change the way people live.

The managing editor said that the personal computer "will salvage the American economy rather than hurt it" and "decades from now, looking back at 1982, we would say that this was the moment the computer revolution was recognised by the population as a whole."

TEXT 3

NEW TRENDS

Most of us will agree that computers have become an integral part of our society. We can touch them and see the results of their seemingly endless capabilities. But computer-literate person recognises that hardware is useless without software, and software is useless without hardware. Hardware and software are as inseparable as bread and butter, football and fall, or politicians and promises.

Today computer operations are directed by a program that is written by a programmer in a particular programming language. And the number of programming languages, developed by specialists for us " to talk " to computers, is large. Moreover, with each language of a new generation, fewer instructions are needed to instruct the computer to perform a particular task. In other words, the trend in program-language development is to make each new language easier to use by reducing the number of programming instructions required for each programming task.

As you progress from one generation of programming languages to the next, fewer instructions are required to perform a particular programming task.

It should be observed that later generations of languages do not necessarily provide us with greater programming capabilities, but they do provide a more sophisticated programmer /computer interaction. In short, each new generation is easier for us to understand and use, but they are not free from certain shortcomings. That's why the earlier languages are still keeping some of their advantages. As a result, all six generations of languages are in use today.

TEXT 4

MACHINE LANGUAGES

Each computer has only one programming language that can be executed - the MACHINE LANGUAGE. We talk of programming in COBOL, PASCAL, and BASIC, but all of these languages must be translated to the machine language of the computer on which the program is to be executed. These and other high-level languages are simply a convenience for the programmer.

Machine-language programs of the first generation were written at the most basic level of computer operation. Because their instructions are directed at this basic level of operation, the machine language and assembler language are collectively called LOW-LEVEL LANGUAGES.

In the machine language, instructions are coded as series of 1s and 0s. As you might expect, machine-language programs are cumbersome and difficult to write. Early programmers had no alternative. But, fortunately, we do.

TEXT 5

FROM DATA TO INFORMATION

Data are the raw material from which information is derived. Information is comprised of data that have been collected and processed into a meaningful form.

We routinely deal with the concepts of data and information in our everyday experiences. We use data to produce information that will help us make decisions. For example, when we wake up in the morning we collect two pieces of data. We look at the time, then recall from our memory the time when our first class begins, or when we are to be at work. Then we subtract the current time from the starting time of the class (or work).

This mental computation provides information on how much time we have to get ready and go. Based on this information, we make a decision to hurry up or to relax and take it easy. We produce information from data to help us make decisions for thousands of situations each day.

TEXT 6

MICROCOMPUTERS: SMALL BUT POWERFUL

MICROPROCESSORS not only set the stage for microcomputers, but they are found in dozens of devices about the home.

The MOTHERBOARD in a microcomputer contains the electronic circuitry for processing and I/O operations, and some memory. The MICRO, also called a PERSONAL COMPUTER or PC, comes in pocket, lap, and desktop sizes.

The most common CONFIGURATION for a micro is a keyboard for input, a MONITOR for SOFT COPY output, a printer for HARD COPY output, and disk drives for permanent storage of data on DISKETTES or MICRODISKS. A diskette is also called a FLEXIBLE DISK or FLOPPY DISK. Multi-user micros are configured with several WORKSTATIONS. Micros can be used as "intelligent" workstations to mainframe computers in all categories of computer usage. In information system/data processing, micros handle virtually all information processing tasks in small organisations, and they handle specific departmental information needs in larger organisations.

The most popular use of micros in the business environment is integrated software: data management, electronic spreadsheet, graphics, word processing, and communications.

TEXT 7

CONFIGURING A MICROCOMPUTER

The microcomputer is the smallest computer system. Even so, it has the same components as mainframe computer systems: input, output, storage, and processing. As you might expect, the input/output components are much slower, and the storage component has a smaller capacity than have the larger systems. The microcomputer and its peripheral devices are called the microcomputer system CONFIGURATION. The configuration of a microcomputer can vary. The most typical micro configuration consists of:

1. A computer.
2. A keyboard for input.
3. A television-like display called a MONITOR for SOFT COPY (temporary) output.
4. A printer for HARD COPY (printed) output.
5. One or two disk drives for permanent storage of data and programs.

In some microcomputer systems these components are purchased as separate physical units, then linked together. In others, two, three, and even all of the com-

ponents can be contained in a single unit. With a few rare exceptions, the printer is a separate unit.

The storage medium of most microcomputers is normally a DISKETTE or a MICRODISK.

TEXT 8

LET'S NAME IT IBM 1130

Having difficulty in conceiving a name for their third-generation minicomputer, IBM's Board of Directors noted that it was 11:30 AM and time for lunch. The IBM 1130, as it was eventually named, was aimed at meeting the demand for small business and scientific research.

TEXT 9

THE MORSE CODE VS. COMPUTER CODES

Samuel F.B. Morse (1791-1872) recognised that two of signals could be sent over a telegraph line. The signals were generated by pressing the transmitter lever down to close the circuit, then releasing it to break the circuit. A quick tap closed the circuit to produce a "dot"; a longer tap produced a "dash." This technique was developed into what we now call the Morse code, which combines dots and dashes to represent alphabetic and numeric characters. The ABCDIC and ASCII codes are similar in the way they combine on-bits and off-bits (1s and 0s).

The big difference between the Morse code and computer codes is the way in which they are interpreted. One is interpreted by humans and the other by computers.

Morse code is still used for wireless communication. Every seafarer knows what to do when an SOS (...---...) comes over the wire.

TEXT 10

THE FUNCTION KEYS

A microcomputer's keyboard is normally the primary input and control device. You enter data and issue commands via the keyboard. It has, besides the standard typewriter keyboard, function keys, also called soft keys. When pressed, these function keys trigger the execution of software, thus the name "soft" key. For example, pressing a particular function key might call up a menu of possible activities that can be performed. Another function key might rearrange the words in a paragraph for the right and left justification. Some keyboards are equipped with a ten-key pad (numbers for rapid numeric data entry).

A keyboard also has CURSOR CONTROL keys. These "arrow" keys allow you to move the cursor up, down, left, and right. The HOME key moves the cursor to the upper left-hand corner of the screen or window area.

TEXT 11

UNCOVERING THE "MYSTERY" OF COMPUTERS

The Four Components. Computers may be technically complex, but they are conceptually simple. A computer system has only four fundamental components - input, processing, output, and storage. Note that a computer system (not a computer) has four components. The actual computer is the processing component and is combined with the other three to form a computer system.

The relationship of data to a computer system is best explained by an analogy to gasoline and an automobile. Data are to a computer system as gas is to a car. Data provide the fuel for a computer system. A computer system without data is like a car with an empty gas tank : no gas, no go; no data, no information.

How a Computer System Works. A computer system can be likened to the biological system of the human body. Your brain is the processing component. Your eyes and ears are input components that send signals to the brain.

TEXT 12

DISKETTES: HANDLE WITH CARE

Costing only a few dollars, a blank diskette has a very modest value. But once you begin to use the diskette, its value, at least to you, increases greatly. Its value includes the many hours of work that you have spent entering data and writing programs. Such a valuable piece of property should be handled with care. Here are a few Do's and Don'ts:

D o :

- Label each diskette with a soft-tipped pen.
- Store diskettes vertically - or, if flat, place no more than ten to a stack.
- Store at temperatures ranging from 50-125 degrees Fahrenheit.
- Keep a back-up of diskettes containing important data and programs.

D o n ' t :

- Fold, spindle, or mutilate.
- Force a diskette into the disk drive (it should slip in with little or no resistance).
- Touch the diskette surface.
- Place near a magnetic field, such as magnetic paper-clip holders, tape demagnetisers, or electric motors.
- Expose diskettes to direct sunlight for a prolonged period.

TEXT 13

NO SMOKING

"No Smoking" signs are commonplace in computer-centre machine rooms, and for good reason. The average smoke particle is approximately 250 millionths of an inch in diameter. For rigid disks, the head flying distance (the distance between the read/write head and the disk surface) is usually less than half the diameter of an average smoke particle. A simple comparison reconfirms one of the first rules of data processing: Don't smoke in the machine room. Smoke and other such foreign matter on the surface of a disk "crash." After a disk-crash, data on the disk are extremely difficult, and sometimes impossible, to retrieve.

TEXT 14

THE MODEM

Telephone lines were designed for voice communication, not data communication. The modem (modulator/demodulator) converts computer-to-workstation electrical digital signals to analogue signals so that the data can be transmitted over telephone lines.

The digital electrical signals are 'modulated' to make sounds similar to those you hear on a touch-tone telephone. Upon reaching their destination, the analogue signals are 'demodulated' by another modem to computer-compatible electrical signals for processing. The process is done in reverse for workstation-to-computer communication. On most workstations, the modem is an optional device that is contained on a circuit board and simply plugged into an empty slot in the workstation. To make the connection with a telephone line, you simply plug the telephone line into the modem, just as you would if connecting a telephone. Modems are 'intelligent' devices that provide some processing capability. For instance, the modem can automatically dial-up the computer (auto-dial), then establish a link (log on), and even answer incoming calls from other computers (auto-answer).

For transmission media other than telephone lines, the modulation/demodulation process is not required. A modem is always required when you 'dial-up' the computer on a telephone line. If you need a telephone hook-up (for a voice conversation) on the same line and do not want to hassle with disconnecting the phone with each use, you can purchase a modem with an acoustical coupler. To make the connection, you mount the telephone handset directly on the acoustical coupler. Some workstations have not only a built-in modem but a built-in telephone as well.

TEXT 15

COMPILATION

The compilation process can be time consuming, especially for large programs. Therefore, if you intend to execute the program at a later time, perhaps during another session, you should store the object program on secondary storage for later recall. On most mainframe computer systems this is done automatically.

If the source program contains a SYNTAX ERROR (e.g., an invalid instruction format), the compiler will display an error message, or diagnostic, on the workstation screen, then terminate the compilation process.

As a programmer, you will make the necessary corrections and attempt the compilation over, and over, and over again, until the program compiles and executes. Don't be discouraged. Very few programs compile on the first, second, or even third attempts. When your program finally compiles and executes, don't be surprised if output is not what you expected. A "clean", or error-free, compilation is likely to surface undetected LOGIC ERRORS. In most cases, you will need to remove a few bugs in the program logic and in the I/O formats before the program is finished.

TEXT 16

CONCEPTS AND PRINCIPLES OF PROGRAMMING

A computer program is made up of a sequence of instructions or STATEMENTS. There are five classifications of instructions :

- Input/output instructions direct the computer to read or write to a peripheral device.
- Computation instructions perform arithmetic operations.
- Control instructions can alter the sequence of a program's execution.
- Data transfer and assignment instructions permit data to be transferred internally.
- Format instructions describe how data are to be entered or outputted from primary storage.

TEXT 17

WRITING PROGRAMS

The writing of a program is a project within itself and follows the following seven steps:

Step 1. Describe the problem.

Step 2. Analyse the problem. Examine the output, input, processing, and file-interaction components.

Step 3. Design the general logic of the program.
Step 4. Design the detailed logic of the program.
Step 5. Code the program. Use appropriate documentation and REUSABLE CODE.
Step 6. Test and debug the program. Programs are DEBUGGED to eliminate errors and to clean up the input/output.
Step 7. Document the program. Once the program has been thoroughly tested, the program documentation is updated and a program documentation package is compiled.

TEXT 18

THE 10 COMMANDMENTS FOR FLOWCHARTING

1. Organise flowcharts in modules.
2. Use standardised symbols only.
3. Vary symbol size, but do not change the shape.
4. Maintain consistent spacing between symbols.
5. Illustrate interaction between all inputs, processing steps, outputs, and files/data bases.
6. Compile with the general sequence of flow from upper left to the lower right.
7. Minimise use of connectors.
8. Do not cross flow lines.
9. Print text.
10. Use a pencil (with a BIG eraser).

TEXT 19

APPLICATIONS AND SYSTEMS SOFTWARE

Most of us will agree that computers have become an integral part of society. We can touch them and see the results of their seemingly endless capabilities. But the computer-literate person recognises that hardware is useless without software, and software is useless without hardware.

A computer system does nothing until directed to do so. A program, which consists of instructions to the computer, is the means by which we tell a computer to perform certain operations. These instructions are logically sequenced and assembled through the act of PROGRAMMING. PROGRAMMERS use a variety of PROGRAMMING LANGUAGES, such as COBOL and BASIC, to communicate instructions to the computer.

We use the term "software" to refer to the programs that direct the activities of the computer system. Software falls into two general categories: applications

and systems. APPLICATIONS SOFTWARE is designed and written to perform specific personal, business, or scientific processing tasks, such as payroll processing or statistical analysis. Other examples include the programs for claims processing (insurance), tax collection (local government), registration (university), order entry processing (manufacturing), and satellite trajectory tables (NASA).

SYSTEMS SOFTWARE is more general than applications software and usually independent of any specific application area. Systems software programs support all applications software by directing the basic functions of the computer.

TEXT 20

THE MOTHER OF SOFTWARE

Commodore Grace Hopper of the U.S.Navy has made life a lot easier for many programmers. As a mathematician at Remington Rand in 1951, she conceived a new type of internal program that could perform certain computer tasks automatically. The program, called a compiler, was designed to scan a programmer's instructions and produce (or compile) these into machine-readable binary instructions. Her reason:

Why start from scratch with every program you write when a compiler could be developed to do a lot of the basic work for you over and over again? Dr. Hopper's "automatic programming" technique was later perfected by others in the field.

TEXT 21

USERS, PROFESSIONALS, AND HACKERS

The majority of white collar workers and a growing number of blue collar workers use the computer in some way every day. These people are referred to as END USERS or, simply, USERS. Traditionally, users have relied on the technical expertise of professional programmers and systems analysts when it comes to writing programs and selecting computers. But more and more users have taken a keen interest in computers and have educated themselves to the point that they can write their own programs, and are comfortable with very sophisticated user-friendly software, and are intelligent consumers of computers and software.

Many of these sophisticated users are HACKERS, a name given to computer enthusiasts who use the computer as a source of enjoyment. Hackers all over the country have formed clubs and associations to share interesting computer discoveries. Hackers are old and young, manager and labourer, ecologist and geologist, all sharing a common bond: to explore the seemingly infinite capabilities of their computers. On occasion, hackers have carried their enthusiasm for computers beyond the limits of the law. It is perfectly legal for willing hackers to share files and

ideas, but it is not legal for hackers to use their computers to tap into sensitive business and government data bases.

TEXT 22

THE INFORMATION SERVICES DEPARTMENT:CAREER FIELDS

Most companies have a computer centre and the personnel to support their information systems. An information system is a computer-based system that provides data processing capability and information for making decisions. This combination of computing equipment (called hardware), the software that instructs the computers what to do, and the people who run the computers and develop the software is often referred to as the Information Services Department or the Data Processing Department.

The Information Services Department handles the organisation's information needs in the same way that the finance department handles the organisation's money needs. The department provides data processing and information-related services to virtually every business area. For example, programmers and systems analysts might work with a plant manager and engineers to develop a computer-base production and inventory-control system.

The career fields in an Information Services Department can be divided into seven groups: management, systems analysis, programming, technical support, data communications, operations, and education.

The number and type of career paths open to someone entering the computer/information systems field is expanding each year. Some of the most visible career paths are SYSTEMS ANALYST, PROGRAMMER (applications and systems), PROGRAMMER/ANALYST, DATA BASE ADMINISTRATOR, LIBRARIAN, CONTROL CLERK, DATA ENTRY OPERATOR, and EDUCATION COORDINATOR.

The actual organisational structure of an information services department will vary considerably from one organisation to the next. Individuals in smaller companies will normally perform several functions. Large companies have enough people to specialize.

PROGRAMMING GROUP

The APPLICATIONS PROGRAMMER, or simply PROGRAMMER, translates analyst-prepared system and input/output specifications into programs. Programmers design the logic, then code, debug, test, and document the programs. The programs that are written by an applications programmer are designed for a certain application, such as market analysis or inventory management.

Sometimes called "implementers" or "miracle workers," programmers are charged with turning specifications into an information system. To do this, they must exhibit logical thinking and overlook nothing. A good programmer is perceptive, patient, persistent, picky, and productive: the 5 Ps of programming.

Some companies distinguish between development and maintenance programmers. Development programmers create new systems. Maintenance programmers enhance systems by modifying programs to meet changing need. On the average, about 50% of the applications programming tasks are related to maintenance and 50% to new development.

A distinction is also made between business systems programmers and scientific programmers.

A person holding a programmer/analyst position performs the functions of both a programmer and a systems analyst. In some companies, you are either a programmer or an analyst. In others, you are part of a combined systems analysis and programming group.

OPERATIONS GROUP

The COMPUTER OPERATOR performs those hardware-based activities that are needed to keep production information systems operational. An operator works in the machine room, and is in constant communication with the computer while monitoring the progress of a number of simultaneous production runs, initiating one-time jobs, and trouble-shooting. If the computer system fails, the operator initiates restart procedures to "bring the system up".

The LIBRARIAN selects the appropriate magnetic tapes and disks from off-line storage and delivers them to the operator. The operator mounts the tapes and disks on the secondary storage devices for processing, then returns them to the librarian for storage. The librarian maintains a status log on each tape and disk. It is not unusual for a computer centre to have hundreds, and even thousands of tapes and disks.

The librarian is also charged with maintaining a reference library filled with computer books, periodicals, and manuals, as well as internal system and program documentation (i.e., data flow diagrams, program listings).

The CONTROL CLERK accounts for all input to and output from the computer centre. The control clerk follows standard procedures to validate the accuracy of the output before it is distributed to the user department.

The DATA ENTRY OPERATOR, sometimes called the key operator, uses key entry devices to transcribe data into machine-readable format. Although most information services departments have a small data entry group, the majority of the data entry operators are "distributed" to the user areas.

SYSTEMS ANALYSIS GROUP

The function of a SYSTEMS ANALYST, or simply "ANALYST", is the analysis, testing, and implementation of information systems. Systems analysts work closely with users to design information that meet their data processing and information needs.

The role of these "problem solvers" is expanding with the technology.

EDUCATION GROUP

The EDUCATION COORDINATOR co-ordinates all computer-related educational activities. Anyone selecting a computer-related career also adopts a life of continuing education. Computer technology is changing rapidly, and you have to run pretty fast just to stand still! The education co-ordinator schedules computer specialists for technical update seminars, video training programs, computer-assisted instruction, and others, as needed. Often, the education co-ordinator conducts the training sessions.

Education co-ordinators are also involved with the development and delivery of user training programs. As systems go on-line and the number of workstations grows, more and more users must be trained in the use of their workstations and systems.

SYSTEMS PROGRAMMERS

SYSTEMS PROGRAMMERS develop and maintain systems software. Remember that systems software is fundamental to the general operation of the computer, that is, it does not address a specific business or scientific problem. Systems software includes operating systems, utility programs, data base management systems, and language compilers.

TEXT 23

YOUR COMPUTER AND YOUR HEALTH: REAL AND IMAGINED PROBLEMS

The computer and its effects on health often evokes baseless fears on the part of the user, a sign no doubt that many people have not completely mastered work with computers. The computer has been accused of causing cataracts and myopia; of emitting harmful rays to the skin and the eyes. Some have even suspected the computer of increasing the risk of a miscarriage for women. The majority of these fears are unjustified. None of the many studies effectuated on the subject have established a causal link between visual deterioration and working on the computer. As for ionising rays and electromagnetic fields, they are always below permitted levels.

On the other hand intensive periods of work on the computer can lead to eye fatigue, stress and muscular-skeletal pains. Nonetheless these symptoms appear mostly when the user ignores a few elementary ergonomically rules, for instance if they subject themselves to unsatisfactory working conditions or use inadequate equipment. Furthermore, certain individuals with particular medical problems will be at greater risk. The possible ill-effects of working on the computer are therefore inseparable from very wide ergonomical, medical and social factors. This is because the root of the problems associated with computing and their solution are more likely to be found through investigating work conditions and customs, general health of the user and even his life-style, than in the technical make up of the computer itself.

GLOSSARY

ALGOL	Short for ALGOrithmic Language or ALGorithmic Oriented Language.
Algorithm	A rule or set of rules for solving a problem in a limited number of steps.
Alphanumeric	Pertaining to a character set that includes letters (u, b, c, etc.), digits (1, 2, 3, etc.), and, usually, other special punctuation character marks (:, ;,?, etc.).
Analog computer	A device that operates on data in the form of continuously variable physical quantities—e.g., pressure, temperature, etc.
Analog signals	Signals used in the telephone system; contrast with digital signal used by computers.
Application programmer	A programmer who writes programs to solve a specific problem or satisfy a specific need.
Arithmetic unit	The part of a central processing unit that does the arithmetic (+, −, X, /) and logic (<, >, =) functions.
Artificial intelligence	Programs that imitate human thinking.
Assembly language	An early symbolic programming language.
Automation	The design and application of methods of making processes automatic, self-moving, or self-controlling.
Auxiliary storage	Also called secondary storage; devices, such as the tape and disk drives which supplement the primary internal storage of a

	computer.
BASIC (beginners all-purpose symbolic instruction code)	A programming language frequently used in timesharing and microcomputing.
Batch processing	Rapid sequential processing of a number of similar items or transactions.
Baud rate	The speed at which a computer sends data to another computer; for example, a computer that transfers data at 1200 baud sends 1200 bits of data per second.
Binary digit	Either of the characters 0 or 1. Abbreviated "bit." A unit of information capacity in a storage device.
Bit	See Binary Digit.
Budget	A quantified program or plan for the operation and control of a business firm.
Byte	A group of adjacent bits operated upon as a unit; often 8 bits.
Canned Program	A standardized program; usually canned programs can be bought from a software house (for large computers) or through a software store (for personal computers).
Cathode ray tube (CRT)	An electronic tube with a screen for displaying information. Also called a monitor or VDT (Video display terminal).
Central Processing Unit (CPU)	The heart of a computer system; it controls the interpretation and execution of instructions.
Centralized	Located in one place, as in a centralized batch system.
Character	One symbol from a set of basic symbols—e.g., the one which correspond to the keys on a typewriter. The symbols usually include the decimal digits 0 through 9, the letters A through Z, punctuation marks, and other special symbols that give commands to the computer.
Chip	An integrated circuit.
Circuit	A system of electrical elements through which electrical current flows.
Circular tracks	The physical arrangement of data on mag-

	netic disks; i.e., data is arranged in a series of concentric circles from the center to the outside of the disk.
Coaxial cable	A transmission line used to transmit high-frequency television, telephone, and data signals.
COBOL Short for Common Business-Oriented Language	A high-level language developed for business data-processing applications.
Command	A special character which directly affects the computer's operation. An instruction in machine language.
Communication equipment	Various types of devices that permit the input and/or output of data transmitted to or between computer systems—e.g., modems and controllers.
Communication link	The physical means by which one location sends data to and receives data from another locations—e.g., telephone lines, coaxial cables, optical fibers.
Compatibility, equipment	The ability of one computer to accept and process data sent by another computer without change.
Compiler	A computer program that translates a program (called the source program) written in a higher-level programming language into a machine-language program.
Component	A basic element or part—e.g., integrated circuits are the basic components of a computer.
Computer Aided Manufacturing	The use of computers to control manufacturing processes.
Computer, desk-top	A small and compact computer. Usually a limited-capability machine because of its smaller memory and less powerful CPU.
Computer, general-purpose	A computer that can perform many different functions. Contrasts with special-purpose computer.
Computer network	A computer system in which physically distant users and devices communicate with one another.

Computer program	A series of instructions or statements, in a form acceptable to a computer, designed to achieve a certain result.
Computer, special-purpose	A computer that can perform only a limited range of functions. Contrasts with general-purpose computer.
Console	The device by which human operators communicate with the computer.
Control unit	The portion of a computer that organizes the flow of data and instructions into and out of the computer system.
Controls, security	Techniques used to protect computer programs, data files, and equipment.
Copy, hard	A printed copy of machine output—for example, printed reports.
Core memory or storage	A form of high-speed storage of data using magnetic cores. Often used as synonym for primary or main storage.
CPU	See Central processing unit.
CRT	See Cathode ray tube.
Data	Information which has been prepared for communication or processing by people or computers.
Data base	A firm's basic information; usually organized into one large file or several related files. This information changes continually as the firm does its business.
Data-base management system (DBMS)	A software system that helps develop and maintain a data base; data-base management systems also help users to gather necessary information from the data base.
Data processing	Changing or transforming data; data processing is often used to refer to number-crunching applications—e.g., accounting, scientific computation, etc.
DB Master	A data-base management system popular with users of microcomputers.
Debug	To locate and remove errors in programs and/or problems with equipment.
Decision Support System (DSS)	Any software system designed to help man-

	agers make better decisions—e.g., financial analysis and budget systems.
Digital computer	A computer in which discrete representation of data is mainly used—i.e., data is represented as bits, 0's or 1's.
Direct access storage device	A device which permits a user to get directly a particular piece of data; see Random Access.
Disk drive	A storage device that holds data on the surface of magnetic disks.
Diskette	A small, plastic disk used as secondary storage on many small computer systems.
Documentation	The preparation of documents which describe the system, the programs prepared, and the changes made at later dates. Most of the documentation is written during the systems analysis and programming stages of development.
Downtime	The length of time a computer system does not work.
Dumb Terminal	An I/O device used in on-line systems. Dumb terminals can only send and receive data. Contrasts with Smart Terminal.
Edit	To change or transform data—e.g., deleting unwanted data, adding of new data, inserting symbols such as page numbers and typewriter characters.
EDP	Electronic Data Processing.
ENIAC	Short for Electronic Numerical Integrator and Calculator; often considered the first fully electronic computer.
Ergonomics	The study of the relationship between people and computers.
Facsimile	Sometimes called Fax; a system for sending images over long distances. Ordinarily, the image is translated into electrical signals by the transmitter, sent over telephone wires, and converted back into an image by the receiver.
Feasibility study	A study comparing the advantages and dis-

	advantages of different systems for meeting a particular need.
Feed	To input data into the machine.
File	A group of related records which are treated as a unit.
Floppy disk	Another name for a diskette.
Flowchart	A diagram that shows the now of data and the operations of that data in either a program or an entire system.
FORTRAN	Formula Translation. A higher-level programming language used mainly for quantitative problems in engineering and science. Functional area A department within an organization charged with the performance of a specific function—e.g., manufacturing, marketing, accounting, etc.
General-purpose Computer	See Computer, General-purpose.
Generation	With reference to computers, computers whose basic components are of similar technology—e.g., fourth-generation computers use VLSI.
Generator	A program that adapts a general-purpose program to fit a specific need—e.g., RPG (Report Program Generator).
GIGO	Short for "Garbage In, Garbage Out"—i.e., false input leads to meaningless output.
Graphics printers	Printers that can display information in visual form—e.g., as bar or pie charts or even more complicated forms.
Hard disk	A storage device which stores data on a hard, or inflexible, disk made usually of metal; offers greater capacity than floppies.
Hardcopy	Output that is in printed form, as opposed to output which merely appears on a terminal screen.
Hardware	The physical equipment or devices forming a computer system. Contrasted with software.
Head	A device used in disk drives and tape drives for reading, writing, or erasing data.

IC	Short for integrated circuit.
Information retrieval	Techniques for recovering specific information from storage—e.g., from disk or tape drives.
Information system	A system that processes and organizes many kinds of data—numerical, visual, textual, etc.
Input/output (I/O) devices	Devices used to achieve communication between computers and their human users.
Integrated Circuit (IC)	The basic component of third-generation computers; essentially a picture of a group of related circuits in or on a piece of semiconducting material—e.g., silicon. Integrated circuits are classified by size, SSI being small-scale integration, MSI being medium-scale integration, LSI being large-scale integration, and VLSI being very large-scale integration.
Interface	A boundary between two systems or devices or between people and machines; an I/O device is an interface between users and a computer system. Internal memory Storage which is part of the central processing unit; synonym for primary storage.
Interpreter	A computer program that translates and executes each source language statement before translating and executing the next one. Contrasts with a compiler which first translates all source language statements and then executes the whole program at once.
K	Short for Kilo. Stands for 1000 characters of memory. For example, a 64K memory chip can store approximately 64,000 characters of information.
Key	(1) A group of characters used to identify a record in a file; a key is often used for sorting the records in the file. For example, the employees in a payroll file can be sorted alphabetically using the letter of their last

	name as a key.
Line printer	A device that is capable of printing one complete line of characters (100 or more characters) all at once.
Load	To put data into computer memory or storage.
Log	A sequential record of everything that happens in a computer system; for example, a log will keep the names of users, the names of the particular files they used, the amount of computer memory and CPU time they used, etc.
Logic	The formal design of an information system.
Machine Language	A language that is used directly by a machine.
Magnetic disk	A device that stores information on the magnetic surface of a rotating disk; also called a disk drive.
Magnetic heads	The parts of a tape or disk drive that read or write data to the storage media.
Mainframe	A large computer; originally the same as central processing unit.
Management information system (MLS)	An information system designed to supply managers with the information needed to plan, organize, staff, and control the operations of their organization.
Manual of procedures	An explicit record of a firm's policies and operating procedures. Such a record is more common in larger and more complex businesses than in smaller ones where face-to-face conversation is used to communicate the business's goals and operating procedures.
Memory	Same as storage.
Microcomputer	A small computer that utilizes a microprocessor as its CPU.
Microprocessor	A computer on a chip; the basic arithmetic, logic, and memory circuits required for processing (generally on one or a few inte-

	grated circuit chips).
Microwave link	A transmission medium in which information is sent through the air by means of relatively short high-frequency electromagnetic waves.
Minicomputer	A relatively small and inexpensive computer which originally became popular with scientists and engineers.
Modem	Short for MOdulator-DEModulator; a device for translating analog signals to digital and vice versa.
Multiprogramming	The ability of a computer system to run two or more programs at the same time.
Natural language	A human language such as English, French, German, etc.
Network	An interconnected group or chain.
Number crunching	Using the computer for the high-speed processing of numerical data.
Object language	The language to which a statement in a higher-level programming language is translated—i.e., machine language.
Off-line devices	Peripheral equipment or devices in a system that are not controlled by the central processing unit—e.g., key punch machines.
On-line devices	Peripheral equipment that is under control of the central processing unit, and in which information is introduced into the system as soon as it occurs—e.g., automated teller machines.
Operating system	Software that controls the overall operations of a computer.
Operator	The person who handles the computer controls, places storage media—e.g., magnetic tape or disk packs—into the input devices, removes the output, and performs other related functions.
Optical Fiber	A transmission medium in which information is sent as pulses of light through a thin flexible glass wire.
Output	The information that is sent from the pr-

	mary storage of a computer to secondary storage or to any output device, such as a printer 01 a terminal screen.
Output device	A device that translates the electrical impulses sent from the CPU into permanent results such as printed reports or magnetic writing on disk or tape.
Peripheral devices	The input, output, and secondary storage devices in a computer system.
Personal computer	A small but relatively powerful microcomputer used in small business, scientific, and engineering applications.
Personnel	The people within a business organization or department.
Point-of-sale terminal	A device for entering sales data into a distributed computer system—e.g., automated teller machines, grocery checkout scanners, etc.
Port	These are communications channels through which computers send and receive data. There are two kinds, serial and parallel. Telephone communication is usually done serially.
Printers	Devices that provide printed, or hardcopy output. There are two basic kinds for microcomputers, Dot-Matrix and Letter Quality. Letter Quality Printers form letters with a single impact, like traditional typewriters, and are used for business correspondence. Dot-Matrix Printers form letters using a rectangular arrangement of pins to make a pattern of dots. Because the quality of the image is less good than for letter-quality printers, dot-matrix printers are used primarily for drafts and in-house reports.
Processing	The change or transformation of information from raw data to useful information.
Processing cycle	The basic operating cycle of a computer system—i.e., input, processing, output.
Program	(1) To design and write a set of computer

	instructions; (2) A set of sequenced instructions which cause a computer to perform specific operations.
Program flowchart	A visual representation of the various operations that a computer must execute to solve a particular problem.
Programmer	A person who designs, writes, and tests computer programs.
Programming language	A language used to write programs; useful because it is easier to understand and use than machine language.
Random access	The ability to find and retrieve particular items of information from the files or memory of a computer system.
Record	The basic element of a file, consisting of a group of related pieces of information—e.g., the employee record for a particular individual will contain his name, address, Social Security Number, etc.
Remote access	The ability of a device distant from a computer facility to communicate with the CPU.
Remote-job-entry (RJE) terminal	A device for entering batches of data into a computer system through a communication link.
Report program generator (RPG)	A system that constructs report-writing programs.
Robots	Computer-controlled machines capable of a variety of tasks; used increasingly in factories and on assembly lines.
Routine	A set of general-use instructions.
Scientific computer	A computer that has a large memory and is capable of handling extremely high-speed calculations.
Secondary storage	See Auxiliary storage.
Sequential or serial processing	The handling of one item after the other.
Shift	To move or change.
Silicon	A naturally occurring substance; frequently used in the manufacture of ICs.
Smart Terminal	An I/O device used in on-line systems. In

Учебное издание

Составители: Александр Алексеевич Жданов
Владимир Николаевич Гриб
Наталья Андреевна Иванова

COMPUTER NOTIONS

ENGLISH READER FOR STUDENTS IN COMPUTER-RELATED FIELDS

Тексты для чтения на английском языке по специальности Т.10.01.00 и Т.10.03.00

Ответственный за выпуск А.А. Жданов
Редактор: Т.В. Строкач

Подписано к печати 27.09.00 Формат 60x84 1/16 Бумага писч. Гарнитура T.N.R Усл. п.л. 2,7 Уч. изд. л. 3 Тираж 250 экз Заказ № 671 Бесплатно. Отпечатано на ризографе Брестского государственного технического университета. 224017, Брест, ул. Московская, 267.