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естественнонаучных специальностей

И.Д. Милохова

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Рецензент д-р пед. наук, проф. Е.Г Кашина
Отв. редактор д-р филол. наук, проф. Э.Б. Яковлева

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Данный практикум предназначен для изучения специальной литературы на английском языке в области информационных технологий. Он содержит тексты из оригинальной литературы, посвященные обсуждению совокупности проблем, связанных с организацией и технологией защиты на объектах информатизации, с программным обеспечением и способами администрирования информационных систем и сетей. Материал практикума способствует усвоению специальной лексики и обсуждению означенных проблем.

Рекомендован для студентов 1-2 курсов специальностей «Компьютерная безопасность», «Организация и технология защиты информации», «Математическое обеспечение и администрирование информационных систем»

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ВВЕДЕНИЕ В СПЕЦИАЛЬНОСТЬ

TEXT 1

1. Vocabulary:

to deal (with) – иметь дело *(с кем-л., чём-л.)*

to elaborate (to work out) programs – разрабатывать программы

computer-aided-design – автоматизированное проектирование

computer-aided-manufacturing – автоматизированное производство

to meet up-to-date demands (requirements) – отвечать современным требованиям

software – программное обеспечение

hardware – аппаратная часть

to offer solutions – предлагать решения

to solve problems – решать проблемы

to defend from viruses – защищать от вирусов

2. Read and translate the text.

COMPUTER SCIENCE

Computer science is a part of an applied mathematics. Specialists in computer science say that this field of knowledge is very interesting because it deals with computer-aided-design (CAD) and computer-aided-manufacturing (CAM).

Computers are intended to improve the productivity of labour of scientists, designers, engineers, managers, and other specialists, because computers offer quick and optimal solutions. One of the main goals of using CAD/CAM is to shorten the time between designing and manufacturing.

Moreover, computers came in our life and to our houses and now we can solve our everyday problems with their help.

Computers can be divided into simple and complex devices. Simple computers such as calculators can perform addition, subtraction, multiplication and division. As far as complex computers are concerned they can do different logical operations and some of them even have artificial intelligence.

Thus in order to elaborate up-to-date and inexpensive programs as well as to defend them from viruses, it is important to know some programming languages.

There are low-level programming languages such as a machine language and an assembly language and high-level programming languages, for instance, FORTRAN, PASCAL, ADA, C, BASIC, etc.

3. Questions:

1. What do specialists in computer science deal with?
2. What are the computers used for?
3. What operations can simple devices perform?
4. What operations do complex computers perform?
5. What are CAD/CAM systems intended to do?
6. What high-level programming languages do you know?

4. What is the main idea of the text?

TEXT 2

1. Vocabulary:

mainframe – (универсальная) вычислительная машина
to execute – исполнять (команду)
to obtain – получить, добиться
set of instructions – набор инструкций
hard disk – жесткий диск
floppy disk – гибкий диск
to input data – вводить данные
to output data – получать данные на выходе
Random access memory – память с произвольной выборкой
Read Only memory – постоянная память
Program storage – память для хранения программ
printed board – печатная плата

2. Read and translate the text.

SOME WORDS ABOUT COMPUTER

Computer can perform many functions: they can do mathematical and logical operations, mathematical operations including arithmetic and algebraic operations, such as addition, subtraction, multiplication and division, raising to a power, differentiating and integrating. Logical operations include comparing, selecting, sorting and matching.

Computers are divided into four main classes: microcomputers, minicomputers, mainframes and supercomputers.

A minicomputer is a computer manufactured on a single printed board which contains one or more chips. Most microcomputers are personal com-

puters. At present personal computers have become so powerful that they are used as CAD/CAM systems.

A microprocessor is a very small device used in microcomputers, which deals with memories by reading and writing process. Microprocessors can obtain from memory and execute a limited set of instructions in order to perform addition or subtraction on a binary word, and to input or output binary data.

Memory is a device for storing digital information. Memory should be small in size and large in capacity. It should take little power and work at the same speed as computer logic. There are many types of memories. All microcomputers use Random Access Memory (RAM) and Read Only Memory (ROM).

RAM is called so because information can be put into or out of any single byte of memory. ROM is permanent memory for program storage.

People know many types of memory units, hard disks and floppy disks being widely used. Floppy disks (flexible plastic disks) are used in personal computers.

3. Questions:

1. What functions can computer perform?
2. Are there four main classes of computers?
3. What is a minicomputer?
4. What can you say about microprocessor?
5. What types of memory do you know?
6. What is the difference between RAM & ROM?
7. What are memory units?

4. Reproduce the main points of the text.

TEXT 3

1. Vocabulary:

high-level language – язык высокого уровня
brief description – краткое описание
to consist (of) – состоять *(из чего-л.)*
programming languages – языки программирования
for commercial purposes – в коммерческих целях
algebraic formulae – алгебраические формулы
general-purpose language – язык общего назначения
application program – прикладная программа
simple language – простой язык
to result (in) – приводить *(к какому-л. результату)*

2. Read and translate the text.

PROGRAMMING LANGUAGES

Computers can deal with different kinds of problems but they must be given the right instructions. Instructions are written in one of the high-level languages, for example, FORTRAN, COBOL, ALGOL, PASCAL, BASIC, or C. But a program written in one of these languages should be interpreted into machine code. Usually when one instruction written in a high-level language is transformed into machine code, it results in several instructions. A brief description of some high-level languages are given below.

FORTRAN is acronym for*FORmula TRANslation*. This language is used for solving scientific and mathematical problems. It consists of algebraic formulae and English phrases.

COBOL is acronym for *COmmon Business-Oriented Languages*. This language is used for commercial purposes. COBOL deals with the problems that do not involve a lot of mathematical calculations.

ALGOL is acronym for *ALGOrithmic Language*. It is used for mathematical and scientific purposes.

BASIC is acronym for *Beginner's All-purpose Symbolic Instruction Code*. It is used by students who require a simple language to begin programming.

C is developed to support the UNIX operating system. C is a general-purpose language.

When a program is designed to do a specific type of work it is called an application program.

3. Questions:

1. What different kinds of problems can computers deal with?
2. What high-level languages do you know?
3. What language is used for solving scientific a mathematical problems?
4. What is an acronym for algorithmic language?
5. What is an application program?

4. What is the main idea of the text?

Основная часть

TEXT 4

1. Vocabulary:

intricate — сложный, запутанный
electronic circuit — электронная цепь, схема
to operate switches — приводить в действие переключатели
to store numbers — запоминать числа
to manipulate — управлять; обращаться; преобразовывать
to input / to feed in — вводить (информацию)
to turn on = to switch on — включать
to turn off - to switch off — выключать
to process data — обрабатывать данные
to supply — подавать, вводить, снабжать, обеспечивать
addition — сложение
subtraction — вычитание
division — деление
multiplication — умножение
exponentiation — возведение в степень
user — пользователь
input device — устройство ввода
disk drive — дисковое запоминающее устройство, дисковод
tape drive — запоминающее устройство на магнитной ленте
to make decisions — принимать решения
instantaneously — мгновенно, немедленно

2. Read and translate the text.

WHAT IS A COMPUTER?

A computer is a machine with an intricate network of electronic circuits that operate switches or magnetize tiny metal cores. The switches, like the cores, are capable of being in one or two possible states, that is, on or off; magnetized or demagnetized. The machine is capable of storing and manipulating numbers, letters, and characters (symbols).

The basic idea of a computer is that we can make the machine do what we want by inputting signals that turn certain switches on and turn others off, or magnetize or do not magnetize the cores.

The basic job of computers is processing of information. For this reason computers can be defined as devices which accept information in the form of instructions, called a program, and characters, called data, perform mathematical and / or logical operations on the information, and then supply results of these operations. The program, or part of it, which tells the computers what to do and

the data, which provide the information needed to solve the problem, are kept inside the computer in a place called memory.

It is considered that computers have many remarkable powers. However most computers, whether large or small, have three basic capabilities.

First, computers have circuits for performing arithmetic operations, such as: addition, subtraction, division, multiplication and exponentiation.

Second, computers have a means of communicating with the user. After all, if we couldn't feed information in and get results back, these machines wouldn't be of much use. Some of the most common methods of inputting information are to use terminals, diskettes, disks and magnetic tapes. The computer's input device (a disk drive or tape drive) reads the information into the computer. For outputting information two common devices used are: a printer, printing the new information on paper, and a cathode-ray-tube display, which shows the results on a TV-like screen.

Third, computers have circuits which can make decisions. The kinds of decisions which computer circuits can make are not of the type: "Who would win the war .between two countries?" or "Who is the richest person in the world?" Unfortunately, the computer can only decide three things, namely: Is one number less than another? Are two numbers equal? and, Is one number greater than another?

A computer can solve a series of problems and make thousands of logical decisions without becoming tired. It can find the solution to a problem in a fraction of the time it takes a human being to do the job.

A computer can replace people in dull, routine tasks, but it works according to the instructions given to it. There are times when a computer seems to operate like a mechanical 'brain', but its achievements are limited by the minds of human beings. A computer cannot do anything unless a person tells it what to do and gives it the necessary information; but because electric pulses can move at the speed of light, a computer can carry out great numbers of arithmetic-logical operations almost instantaneously. A person can do the same, but in many cases that person would be dead long before the job was finished.

3. Questions:

1. What is a computer?
2. What are the two possible states of the switches?
3. What are the main functions of a computer?
4. In what way can we make the computer do what we want?
5. What is the basic task of a computer?
6. In what form does a computer accept information?
7. What is a program?
8. What are data?
9. What is memory?
10. What three basic capabilities have computers?
11. What are the ways of inputting information into the computer?
12. What is the function of an input device?

13. What devices are used for outputting information?
14. What decisions can the computer make?
15. What are the computer's achievements limited by?

4. Give a brief summary of the text.

TEXT 5

1. Vocabulary:

calculating device – вычислительное устройство
multiple – кратный
abacus – счеты
slide rule – логарифмическая линейка
logarithm table – логарифмическая таблица
calculus – исчисление; математический анализ
general-purpose – общего назначения, универсальный
to cut out the human being altogether – полностью исключить человека
to manipulate – обрабатывать, преобразовывать; управлять
data processing – обработка данных (информации)
to tabulate the census – занести данные по переписи (населения) в таблицу
means of coding – средства кодирования (шифровки)
to punch the holes – пробивать отверстия
punched card – перфокарта
to perform – выполнять, производить (действие); осуществлять
unit of data – единица информации
keyboard terminals – терминал (вывод) с клавишным управлением
proliferation – размножение, быстрое увеличение

2. Read and translate the text.

THE FIRST CALCULATING DEVICES

Let us take a look at the history of computers that we know today. The very first calculating device used was the ten fingers of a man's hands. This, in fact, is why today we still count in tens and multiples of tens.

Then the abacus was invented. People went on using some form of abacus well into the 16^{th} century, and it is still being used in some parts of the world because it can be understood without knowing how to read.

During the 17^{th} and 18^{th} centuries many people tried to find easy ways of calculating. J.Napier, a Scotsman, invented a mechanical way of multiplying and dividing, which is now the modern slide rule works. Henry Briggs used Napier's ideas to produce logarithm tables which all mathematicians use today.

Calculus, another branch of mathematics, was independently invented by both Sir Isaak Newton, an Englishman, and Leibnitz, a German mathematician.

The first real calculating machine appeared in 1820 as the result of several people's experiments.

In 1830 Charles Babbage, a gifted English mathematician, proposed to build a general-purpose problem-solving machine that he called "the analytical engine". This machine, which Babbage showed at the Paris Exhibition in 1855, was an attempt to cut out the human being altogether, except for providing the machine with the necessary facts about the problem to be solved. He never finished this work, but many of his ideas were the basis for building today's computers.

By the early part of the twentieth century electromechanical machines had been developed and were used for business data processing. Dr. Herman Hollerith, a young statistician from the US Census Bureau successfully tabulated the 1890 census. Hollerith invented a means of coding the data by punching holes into cards. He built one machine to punch the holes and others to tabulate the collected data. Later Hollerith left the Census Bureau and established his own tabulating machine company. Through a series of merges the company eventually became the IBM Corporation.

Until the middle of the twentieth century machines designed to manipulate punched card data were widely used for business data processing. These early electromechanical data processors were called unit record machines because each punched card contained a unit of data.

In the mid—1940s electronic computers were developed to perform calculations for military and scientific purposes. By the end of the 1960s commercial models of these computers were widely used for both scientific computation and business data processing. Initially these computers accepted their input data from punched cards. By the late 1970s punched cards had been almost universally replaced by keyboard terminals. Since that time advances in science have led to the proliferation of computers throughout our society, and the past is but the prologue that gives us a glimpse of the future.

3. Questions:

1. What was the very first calculating device?
2. What is the abacus?
3. What is the modern slide rule?
4. Who gave the ideas for producing logarithm tables?
5. How did Newton and Leibnitz contribute to the problem of calculation?
6. When did the first calculating machine appear?
7. What was the main idea of Ch.Babbage's machine?
8. How did electromechanical machines appear and what were they used for?
9. What means of coding the data did Hollerith devise?
10. How were those electromechanical machines called and why?
11. What kind of computers appeared later?
12. What new had the computers of 1970s?

4. Sum up the contents of the text.

TEXT 6

1. Vocabulary:

to manage — управлять; организовывать; справляться
to obtain — получать; достигать; добиваться
to cause — заставлять; вынуждать; вызывать; быть причиной; причина, основание
flow — поток; ход (выполнения программы); последовательность
counter — счетчик
register — регистр; устройство регистрации; счетчик; датчик
instruction register — регистр команд
storage register— регистр памяти; запоминающий регистр
address register — адресный регистр
temporarily — временно
decoder — дешифратор
operand address — адрес (хранения) операнда
mark — отметка; маркер; знак; помечать; обозначать; выделять
timing mark — отметка времени
to accumulate — накапливать(ся); суммировать; собирать(ся)
accumulator — сумматор; накапливающий регистр; устройство суммирования
to compare — сравнивать; соотноситься
comparer — компаратор; устройство сравнения
content — содержимое; смысл; объем; количество
to involve — включать; содержать; заключать (в себе)
core — суть; основная часть; ядро; оперативная память
to add — складывать; суммировать; прибавлять; присоединять
added — добавочный; дополнительный
adder — сумматор; блок суммирования
at least — по крайней мере

2. Read and translate the text.

THE CPU MAIN COMPONENTS

As it is known the two functional units of the CPU are the control unit (CU) and the arithmetic-logical unit (ALU). The control unit manages and coordinates the entire computer system. It obtains instructions from the program stored in main memory, interprets the instructions, and issues signals that cause other units of the system to execute them.

The control unit operates by reading one instruction at a time from memory and taking the action called for by each instruction. In this way it controls the flow between the main storage and the arithmetic-logical unit.

The control unit has the following components: *a counter* that selects the instructions, one at a time, from memory; *a register* that temporarily holds the instructions read from memory while it is being executed; *a decoder that* takes the coded instruction and breaks it down into individual commands necessary to carry it out; *a clock,* which produces marks at regular intervals. These timing marks are electronic and very rapid.

The sequence of control unit operations is as follows. The next instruction to be executed is read out from primary storage into the storage register. The instruction is passed from the storage register to the instruction register. Then the operation part of the instruction is decoded so that the proper arithmetic or logical operation can be performed. The address of the operand is sent from the instruction register to the address register. At last the instruction counter register provides the address register with the address of the next instruction to be executed.

The arithmetic-logical unit (ALU) executes the processing operations called for by the instructions brought from main memory by the control unit. Binary arithmetic, the logical operations and some special functions are performed by the arithmetical-logical unit.

Data enter the ALU and return to main storage through the *storage register.* The *accumulator* serving as a register holds the results of processing operations. The results of arithmetic operations are returned to the accumulator for transfer to main storage through the storage register. The *comparer performs* logical comparisons of the contents of the storage register and the accumulator. Typically, the comparer tests for conditions such as "less than", "equal to", or "greater than".

So as you see the primary components of the arithmetic-logical unit are banks of bistable devices, which are called registers. Their purpose is to hold the numbers involved in the calculation and hold the results temporarily until they can be transferred to memory. At the core of the ALU is a very high- speed binary adder, which is used to carry out at least the four basic arithmetic functions (addition, subtraction, multiplication and division). The logical unit consists of electronic circuitry which compares information and makes decisions based upon the results of the comparison.

3. Questions:

1. What are the functional units of CPU?
2. What is the function of CU?
3. How does CU operate?
4. What is the function of a counter?
5. What role does a decoder play?
6. What is the sequence of CU operations?
7. What is the function of the arithmetic-logical unit?
8. What operations are performed by ALU?

9. What primary components does ALU consist of?
10. What is the function of an accumulator / comparer?

4. Give a brief summary of the text.

TEXT 7

1. Vocabulary:

central processing unit (CPU) — центральный процессор (ЦП)
interchangeably — взаимозаменяемым образом
precisely — точно
internal memory — внутренняя память; внутреннее ЗУ
activity — деятельность; работа; действия операции
to issue — посылать (сигнал); выводить, выдавать (сообщение)
response — ответ; отклик; реакция; отвечать; реагировать
to interprete — интерпретировать; истолковывать;
according to — согласно; в соответствии с
level — уровень; степень; мера; выравнивать
input-output port — порт ввода-вывода
control unit (CU) — устройство управления
arithmetic-logical unit (ALU) — арифметико-логическое устройство
switch — переключатель; коммутатор; переключать; переходить
to direct — направлять; адресовать; указывать; прямой; непосредственный
step-by-step operations — пошаговые операции
to select — выбирать; выделять (на экране)
on the other hand — с другой стороны
exponentiation — возведение в степень
to call for — требовать; предусматривать
to load — загружать; выполнять загрузку

2. Read and translate the text.

CENTRAL PROCESSING UNIT

It is well known in computer science that the words 'computer' and 'processor' are used interchangeably. Speaking more precisely, 'computer' refers to the central processing unit (CPU) together with an internal memory. The internal memory, control and processing components make up the heart of the computer system. Manufactures design the CPU to control and carry out basic instructions for their particular computer.

The CPU coordinates all the activities of the various components of the computer. It determines which operations should be carried out and in what or-

der. The CPU controls the operation of the entire system by issueing commands to other parts of the system and by acting on responses. When required it reads information from the memory, interprets instructions, performs operations on the data according to the instructions, writes the results back into the memory and moves information between memory levels or through the input-output ports.

In digital computers the CPU can be divided into two functional units called the control unit (CU) and the arithmetic-logical unit (ALU). These two units are made up of electronic circuits with millions of switches that can be in one of two states, either on or off.

The function of the CU within the central processor is to transmit coordinating control signals and commands. The control unit is that part of the computer that directs the sequence of step-by-step operations of the system, selects instructions and data from memory, interprets the program instructions, and controls the flow between main storage and the arithmetic-logical unit.

The ALU, on the other hand, is that part of the computer in which the actual arithmetic operations, namely, addition, subtraction, multiplication, division and exponentiation, called for in the instructions are performed.

Programs and the data on which the CU and the ALU operate, must be in internal memory in order to be processed. Thus, if located in secondary memory devices, such as disks or tapes, programs and data are first loaded into internal memory.

3. Questions:

1. What words in computer science are used interchangeably and why?
2. What components make up the heart of the computer system.
3. What is the function of the CPU?
4. In what way does the CPU control the operation of the whole system?
5. Name the sequence of operations the CPU performs (use five verbs).
6. What are the CPU functional units made of?
7. What is the function of the CU?
8. What operations are performed in the ALU?
9. Where are data processed?
10. Where are data to be processed loaded into?

4. What is the main idea of the text?

TEXT 8

1. Vocabulary:

data processing — обработка информации (данных)
to convert — преобразовывать; переводить (в др. единицы)
to accomplish — завершать, заканчивать; осуществлять, выполнять
to house — помещать, размещать
to improve — улучшать, совершенствовать
to control — управлять, регулировать; управление, регулирование
to store — хранить, запоминать, заносить (размещать) в памяти
storage — запоминающее устройство, память; хранение
resource — ресурс; средство; возможность
facility — устройство; средство
facilities — приспособления; возможности
equipment — оборудование; аппаратура; приборы; устройства
available — доступный; имеющийся (в наличии); возможный
display — дисплей; устройство (визуального) отображения; показ
manner — способ, образ (действий)
sequence — последовательность, порядок (следования)
successively — последовательно
data storage hierarchy — иерархия (последовательность) запоминания информации (данных)
to enter — входить; вводить (данные); заносить, записывать
comprehensive groupings — полные, обширные, универсальные образования
meaningful — имеющий смысл; значащий (о данных)
item — элемент; составная часть
record — запись, регистрация; записывать, регистрировать
file — файл; заносить (хранить) в файл
set — набор; множество; совокупность; серия; группа; система
data base — база данных
related — смежный; взаимосвязанный; относящийся (к ч.-л.)

2. Read and translate the text.

DATA PROCESSING AND DATA PROCESSING SYSTEMS

The necessary data are processed by a computer to become useful information. In fact this is the definition of data processing. *Data* are a collection of facts — unorganized but able to be organized into useful information. *Processing* is a series of actions or operations that convert inputs into outputs. When we speak of data processing, the input is data, and the output is useful information. So, we can define *data processing* as a series of actions or operations that converts data into useful information.

We use the term *data processing system* to include the resources that are used to accomplish the processing of data. There are four types of resources: people, materials, facilities, and equipment. People provide input to computers, operate them, and use their output. Materials, such as boxes of paper and printer ribbons, are consumed in great quantity. Facilities are required to house the computer equipment, people and materials.

The need for converting facts into useful information is not a phenomenon of modern life. Throughout history, and even prehistory, people have found it necessary to sort data into forms that were easier to understand. For example, the ancient Egyptians recorded the ebb and flow of the Nile River and used this information to predict yearly crop yields. Today computers convert data about land and water into recommendations to farmers on crop planting. Mechanical aids to computation were developed and improved upon in Europe, Asia, and America throughout the seventeenth, eighteenth, and nineteenth centuries. Modern computers are marvels of an electronics technology that continues to produce smaller, cheaper, and more powerful components.

Basic data processing operations

Five basic operations are characteristic of all data processing systems: inputting, storing, processing, outputting, and controlling. They are defined as follows.

Inputting is the process of entering data, which are collected facts, into a data processing system. *Storing* is saving data or information so that they are available for initial or for additional processing. *Processing* represents performing arithmetic or logical operations on data in order to convert them into useful information. *Outputting* is the process of producing useful information, such as a printed report or visual display.

Controlling is directing the manner and sequence in which all of the above operations are performed.

Data storage hierarchy

It is known that data, once entered, are organized and stored in successively more comprehensive groupings. Generally, these groupings are called a data storage hierarchy. The general groupings of any data storage hierarchy are as follows.

1) *Characters,* which are all written language symbols: letters, numbers, and special symbols. 2) *Data elements,* which are meaningful collections of related characters. Data elements are also called data items or fields. 3) *Records,* which are collections of related data elements. 4) *Files,* which are collections of related records. A set of related files is called a data base or a data bank.

3. Questions:

1. What is processing?
2. What is data processing?

3. What does the term of data processing system mean?
4. What basic operations does a data processing system include?
5. What is inputting / storing / outputting information?
6. What do you understand by resources?
7. How did ancient Egyptians convert facts into useful information?
8. When were mechanical aids for computation developed?
9. What does data storage hierarchy mean?
10. What are the general groupings of any data storage hierarchy?

4. Sum up the contents of the text.

TEXT 9

1. Vocabulary:
manual — ручной, выполняемый вручную
to take advantage of smth — воспользоваться чем-либо
capability — способность; возможность; характеристика
accuracy — точность; правильность; четкость (изображения)
correctly — правильно; верно
to eliminate — устранять; удалять; отменять; ликвидировать
to make errors — допускать ошибки (погрешности)
error-prone — подверженный ошибкам
to remain vulnerable — оставаться уязвимым, чувствительным
invalid data — неверные, неправильные, недопустимые данные
communications networks — сети передачи данных; сети связи
travel — перемещение; прохождение; путь; ход
instant response — мгновенный ответ (реакция)
to respond — отвечать; реагировать
access — доступ; обращение; обращаться, иметь доступ
capacity of storage — объем (емкость) памяти
to retrieve — извлекать, выбирать (данные); восстанавливать (файл)
value — значение; величина; значимость; ценность; оценка; оценивать
objective — цель; требование; целевая функция
cost-effective — экономичный; экономически оправданный
challenge — трудность; препятствие; представлять трудность

2. Read and translate the text.

ADVANTAGES OF COMPUTER DATA PROCESSING

Computer-oriented data processing systems or just computer data processing systems are not designed to imitate manual systems. They should combine

the capabilities of both humans and computers. Computer data processing systems can be designed to take advantage of four capabilities of computers.

1. *Accuracy.* Once data have been entered correctly into the computer component of a data processing system, the need for further manipulation by humans is eliminated, and the possibility of error is reduced. Computers, when properly programmed, are also unlikely to make computational errors. Of course, computer systems remain vulnerable to the entry by humans of invalid data.

2. *Ease of communications.* Data, once entered, can be transmitted wherever needed by communications networks. These may be either earth or satellite-based systems. A travel reservations system is an example of a data communications network. Reservation clerks throughout the world may make an enquiry about transportation or lodgings and receive an almost instant response. Another example is an office communications system that provides executives with access to a reservoir of date, called a corporate data base, from their personal microcomputer work stations.

3. *Capacity of storage.* Computers are able to store vast amounts of information, to organize it, and to retrieve it in ways that are far beyond the capabilities of humans. The amount of data that can be stored on devices such as magnetic discs is constantly increasing. All the while, the cost per character of data stored is decreasing.

4. *Speed.* The speed, at which computer data processing systems can respond, adds to their value. For example, the travel reservations system mentioned above would not be useful if clients had to wait more than a few seconds for a response. The response required might be a fraction of a second.

Thus, an important objective in the design of computer data processing systems is to allow computers to do what they do best and to free humans from routine, error-prone tasks. The most cost-effective computer data processing system is the one that does the job effectively and at the least cost. By using computers in a cost-effective manner, we will be better able to respond to the challenges and opportunities of our post-industrial, information-dependent society.

3. Questions:

1. What capabilities should data-processing systems combine when designed?
2. What are the main advantages of computers?
3. What do you know of computers accuracy?
4. What is the function of communication networks?
5. Give examples of a data communication network.
6. What do you understand by capacity storage?
7. What other values of computer data processing systems do you know?
8. What is an important objective in the design of computer data processing systems?
9. What is the most effective computer data processing system?

10. What is the best way of responding to the challenges and opportunities of our post-industrial society?

4. Reproduce the main points of the text.

TEXT 10

1. Vocabulary:

environment — среда; окружение; режим работы
external environment — внешняя среда
human-related — (взаимо)связанный с человеком
human-independent — независимый от человека
remote terminal — удаленный терминал
reel of magnetic tape — бобина с магнитной лентой
input-output interface — интерфейс (сопряжение, место стыковки) ввода-вывода
to scan — просматривать; сканировать; развертывать
scanner — сканер; устройство оптического считывания
bar-code scanner / bar-code reader — устройство считывания штрих-кода
regardless of — несмотря на; независимо от
to match characteristics — сопоставлять параметры
similarly — подобным образом; так же; аналогично
to fall between — падать; попадать в интервал между
card reader — устройство считывания платы (карты)
line printer — построчный принтер; принтер печатания строки
page printer — принтер с постраничной печатью
character printer — принтер с посимвольной печатью
optical character reader — оптическое считывающее устройство текста
optical mark reader — оптическое считывающее устройство знаков
visual display — визуальный индикатор
digitizer — аналого-цифровой преобразователь; сканер
keyboard input device — клавишное устройство ввода
plotter — графопостроитель
voice recognition and response unit — устройство распознавания голоса и реагирования

2. Read and translate the text.

INPUT-OUTPUT ENVIRONMENT

Data and instructions must enter the data processing system, and information must leave it. These operations are performed by input and output (I/O) units that link the computer to its external environment.

The I/O environment may be human-related or human-independent. A remote banking terminal is an example of a human-related input environment, and a printer is an example of
a device that produces output in a human-readable format. An example of a human-independent input environment is a device that measures traffic flow. A reel of magnetic tape upon which the collected data are stored in binary format is an example of a human-independent output.

Input-Output Interfaces. Data enter input units in forms that depend upon the particular device used. For example, data are entered from a keyboard in a manner similar to typing, and this differs from the way that data are entered by a bar-code scanner. However, regardless of the forms in which they receive their inputs, all input devices must provide a computer with data that are transformed into the binary codes that the primary memory of the computer is designed to accept. This transformation is accomplished by units called I/O interfaces. Input interfaces are designed to match the unique physical or electrical characteristics of input devices to the requirements of the computer system. Similarly, when output is available, output interfaces must be designed to reverse the process and to adapt the output to the external environment. These I/O interfaces are also called channels or input-output processors (IOP).

The major differences between devices are the media that they use and the speed with which they are able to transfer data to or from primary storage.

Input-Output Device Speed. Input-output devices can be classified as high-speed, medium-speed, and low-speed. The devices are grouped according to their speed. It should be noted that the high-speed devices are entirely electronic in their operation or magnetic media that can be moved at high speed. Those high-speed devices are both input and output devices and are used as secondary storage. The low-speed devices are those with complex mechanical motion or operate at the speed of a human operator. The medium-speed devices are those that fall between — they tend to have mechanical moving parts which are more complex than the high-speed devices but not as complex as the low-speed.

High-speed devices: magnetic disk; magnetic tape.

Medium-speed devices: card readers; line printers; page printers; computer output microfilms; magnetic diskette; optical character readers; optical mark readers; visual displays.

Low-speed devices: bar-code readers; character printers; digitizers; keyboard input devices; plotters; voice recognition and response units.

3. Questions:

1. What is the purpose of input and output devices?
2. What types of input-output devices do you know?
3. Why are data transformed into a binary code while entering the input device?
4. Give an example of a human independent output.

5. What is an I/O interface?
6. What are the major differences between the various I/O devices?
7. What types of I/O devices tend to be high-speed devices?
8. What types of devices tend to be low-speed devices?

4. What is the main idea of the text?

TEXT 11

1. Vocabulary:

primary / secondary storage — первичное / вторичное запоминающее устройство

main storage — основная память; оперативное запоминающее устройство

internal storage — внутреннее ЗУ

sequence — последовательность; порядок следования

intermediate results — промежуточные результаты

ongoing process — продолжающий(-ся), постоянный процесс

similarity — сходство; подобие

to retain — сохранять; удерживать

to locate — размещать(ся); располагать(ся)

value — значение, величина; значимость, ценность; оценка

binary digit — двоичная цифра; двоичный знак

adjacent — смежный; соседний; примыкающий

strings of characters — последовательность символов

consecutive — последовательный; смежный; соседний

2. Read and translate the text.

STORAGE UNITS

Computer system architecture is organized around the primary storage unit because all data and instructions used by the computer system must pass through primary storage. Our discussion of computer system units will begin with the functions of the primary and secondary storage units. This leads to the examination of the central processing unit and from there to the consideration of the input and output units. Therefore, the sequence in which we'll describe the functional units of a digital computer is: 1) storage units, primary and secondary; 2) central processing unit; 3) input and output units.

As you know, there are primary and secondary storage units. Both contain data and the instructions for processing the data. Data as well as instructions" must flow into and out of primary storage.

Primary storage is also called main storage or internal storage. The specific functions of internal storage are to hold (store): 1) all data to be processed; 2) intermediate results of processing; 3) final results of processing; 4) all the instructions required for ongoing process. Another name for primary storage is memory, because of its similarity to a function of the human brain. However, computer storage differs from human memory in important respects. Computer memory must be able to retain very large numbers of symbol combinations, without forgetting or changing any details. It must be able to locate all its contents quickly upon demand. The combinations of characters, that is, the letters, numbers, and special symbols by which we usually communicate, are coded. The codes used by computer designers are based upon a number system that has only two possible values, 0 and 1. A number system with only two digits, 0 and 1, is called *a binary number system.* Each binary digit is called a bit, from BInary digiT. As the information capacity of a single bit is limited to 2 alternatives, codes used by computer designers are based upon combinations of bits. These combinations are called *binary codes.* The most common binary codes are 8-bit codes because an 8-bit code provides for 2/8, or 256 unique combinations of I's and O's, and this is more than adequate to represent all of the characters by which we communicate.

Data in the form of coded characters are stored in adjacent storage locations in main memory in two principal ways: 1) as "strings" of characters — in bytes; and 2) within fixed-size "boxes" — in words. A fixed number of consecutive bits that represent a character is called *a byte.* The most common byte size is 8-bit byte. *Words* are usually 1 or more bytes in length.

Secondary storage. Primary storage is expensive because each bit is represented by a high-speed device, such as a semiconductor. A million bytes (that is, 8 million bits) is a large amount of primary storage. Often it is necessary to store many millions, sometimes billions, of bytes of data. Therefore slower, less expensive storage units are available for computer systems. These units are called *secondary storage.* Data are stored in them in the same binary codes as in main storage and are made available to main storage as needed.

3. Questions:

1. What are the functional units of a digital computer?
2. What units make up the central processing unit?
3. How is computer system organized?
4. What are the two main types of storage units?
5. What do they contain?
6. What is the function of a primary storage?
7. Why is primary storage often called memory?
8. In what respect does computer memory differ from human memory?
9. What are codes based on?
10. What is secondary storage and what is it used for?

4. Sum up the contents of the text.

TEXT 12

1. Vocabulary:

large-scale — большой; крупномасштабный
flip-flop — триггер
circuit — цепь; контур; схема
to employ — использовать; употреблять; применять
logic gates — логический элемент; схема пропускания (сигналов); проход
feasible — возможный; выполнимый; осуществимый
to interpret orders — интерпретировать, истолковывать команды
to operate switches — приводить в действие переключатели
to convey — передавать; сообщать
in response to — в ответ на
correct operand — нужный операнд
original input data — исходная вводимая информация
to proceed — продолжать(ся); возобновлять(ся); действовать
room — (свободное) место; свободная память

2. Read and translate the text.

SOME FEATURES OF A DIGITAL COMPUTER

It should be noticed that even in a large-scale digital system, such as in a computer, or in a data-processing, control or digital-communication system, there are only a few basic operations which must be performed. These operations may be operated many times. The four circuits most commonly employed in such systems are known as the *OR, AND, NOT and FLIP-FLOP*. They are called logic gates or circuits.

An electronic digital computer is a system which processes and stores very large amount of data and which solves scientific problems of numerical computations of such complexity and with such speed that solution by human calculation is not feasible. So the computer as a system can perform numerical computations and follow instructions with extreme speed but it cannot program itself.

We know that the numbers and the instructions which form the program, the computer is to follow, are stored in an essential part of the computer called the memory. The second important unit of the computer is the control whose function is to interpret orders. The control must convert the command into an appropriate set of voltages to operate switches and carry out the instructions conveyed by the order. The third basic element of a computer is the arithmetic device, which contains the circuits performing the arithmetic computations: addition, subtraction, etc. The control and arithmetic components are called the central processor. Finally a com-

puter requires appropriate input-output devices for inserting numbers and orders into the memory and for reading the final result.

Suppose a command to perform an addition or division has been transmitted to the central processor. In response to this order the control must select the correct operands from the memory, transmit them to the arithmetic unit and return to the memory the result of the computation. The memory serves for storing not only the original input data, but also the partial results which will have to be used again as the computation proceeds.

Lastly, if the computation doesn't stop with the execution of this instruction and the storage of the partial result, the control unit must automatically pass on to the next instruction. The connection of the control unit back to the input permits insertion of more data when there is room in the memory.

3. Questions:

1. What are the most commonly used circuits in any computer?
2. How are they called?
3. What kind of a system is a digital computer?
4. Is there anything that a computer cannot do itself? What is it?
5. Where are the instructions and digits stored?
6. What is the function of the control?
7. What does the arithmetic device serve for?
8. What components form the central processor?
9. What other devices in addition to the above-mentioned ones does a computer require?
10. How are computations performed in a computer?

4. Give a brief summary of the text.

TEXT 13

1. Vocabulary:

equation — уравнение, приравнивание
list of instructions — перечень команд
to guard — защищать; предохранять; завершать; заканчивать
appropriate sequence — необходимая (требуемая) последовательность
program logic — логическая последовательность выполнения программы
flowchart — блок-схема; составлять блок-схему
flowcharting — построение блок-схемы
pictorial representation — наглядное представление
predefined symbols — заранее заданные символы
specifics — специальные черты; характерные особенности

emplate — шаблон; маска; образец; эталон
pseudocode — псевдокод; псевдопрограмма
burden — издержки; затраты
programming rules — правила программирования
to consume — потреблять; расходовать
to emphasize — выделять; подчеркивать
top-down approach — принцип нисходящей разработки
looping logic — логическая схема выполнения (операций) в цикле

2. Read and translate the text.

COMPUTER PROGRAMMING

Programming is the process of preparing a set of coded instructions which enables the computer to solve specific problems or to perform specific functions. The essence of computer programming is the encoding of the program for the computer by means of algorythms. The thing is that any problem is expressed in mathematical terms, it contains formulae, equations and calculations. But the computer cannot manipulate formulae, equations and calculations. Any problem must be specially processed for the computer to understand it, that is — coded or programmed.

The phase in which the system's computer programs are written is called the development phase. The programs are lists of instructions that will be followed by the control unit of the central processing unit (CPU). The instructions of the program must be complete and in the appropriate sequence, or else the wrong answers will result. To guard against these errors in logic and to document the program's logical approach, logic plans should be developed.

There are two common techniques for planning the logic of a program. The first technique is flowcharting. A flowchart is a plan in the form of a graphic or pictorial representation that uses predefined symbols to illustrate the program logic. It is, therefore, a "picture" of the logical steps to be performed by the computer. Each of the predefined symbol shapes stands for a general operation. The symbol shape communicates the nature of the general operation, and the specifics are written within the symbol. A plastic or metal guide called a template is used to make drawing the symbols easier.

The second technique for planning program logic is called pseudocode. Pseudocode is an imitation of actual program instructions. It allows a program-like structure without the burden of programming rules to follow. Pseudocode is less time-consuming for the professional programmer than is flowcharting. It also emphasizes a top-down approach to program structure. Pseudocode has three basic structures: sequence, decision, and looping logic. With these three structures, any required logic can be expressed.

3. Questions:

1. What is programming?
2. What is the essence of programming?
3. What should be done with the problem before processing by the computer?
4. What is a program?
5. What are instructions?
6. What are the main techniques for planning the program logic?
7. What is a flowchart?
8. What is a template and what is it used for?
9. What do you understand by "pseudocode"?
10. What are the basic structures of pseudocode?

4. Give a brief summary of the text.

TEXT 14

1. Vocabulary:

programming language — язык программирования
coded form — кодированный вид; кодированное представление
to convey — передавать; сообщать
to improve — улучшать, совершенствовать
machine-oriented language — машинно-ориентированный язык
business-oriented language — язык для (программирования) экономических задач
problem-oriented language — проблемно-ориентированный язык
string of binary — строка двоичного представления
data handling — обработка, данных; работа с данными
field-name length — длина имени поля
incorporate features — включать свойства, особенности
versatile — многофункциональный; разносторонний; универсальный
generous — большой, значительный (о количестве)
mathematical relationship — математическая связь (соотношение)
generous — большой, значительный (о количестве)
mathematical relationship — математическая связь (соотношение)

2. Read and translate the text.

THE MOST COMMON PROGRAMMING LANGUAGES

Let's assume that we have studied the problem, designed a logical plan (our flowchart or pseudocode), and are now ready to write the program instructions. The process of writing program instructions is called coding. The instructions will be written on a form called a coding form. The instructions we write will be

recorded in a machine-readable form using a keypunch, key-to-tape, or key-to-disk, or entered directly into computer memory through a terminal keyboard.

The computer cannot understand instructions written in just any old way. The instructions must be written according to a set of rules. These rules are the foundation of a programming language. A programming language must convey the logical steps of the program plan in such a way that the control unit of the CPU can interpret and follow the instructions. Programming languages have improved throughout the years, just as computer hardware has improved. They have progressed from machine- oriented languages that use strings of binary Is and Os to problem-oriented languages that use common mathematical and/or English terms.

There are over 200 problem-oriented languages. The most common of them are COBOL, FORTRAN, PL/I, RPG, BASIC, PASCAL.

COBOL

COBOL was the most widely used business-oriented programming language. Its name is an acronym for Common Aisi-ness-Oriented language. COBOL was designed to solve problems that are oriented toward data handling and input-output operations. Of course, COBOL can perform arithmetic operations as well, but its greatest flexibility is in data handling. COBOL also was designed as a self-documenting language. Self-documenting languages are those that do not require a great deal of explanation in order to be understood by someone reading the program instructions. The self-documenting aspect of COBOL is made possible by its sentencelike structure and the very generous maximum symbolic field-name length of 30 characters. With a field-name length of up to 30 characters, the name can clearly identify the field and its purpose.

FORTRAN IV

The FORTRAN IV language is oriented toward solving problems of a mathematical nature. The name FORTRAN comes from the combination of the words *formula* translation. The version of FORTRAN IV has been designed as algebra-based programming language. Any formula or those mathematical relationships that can be expressed algebraically can easily be expressed as a FORTRAN instruction, FORTRAN is the most commonly used language for scientific applications.

PL/I

PL/I stands for programming language I. It was designed as a general-purpose language incorporating features similar to COBOL for data handling instructions and features similar to FORTRAN for mathematical instructions. PL/I is much more than a combination of the good features of both COBOL and FORTRAN, as it has many capabilities that are unique. Yet, although PL/I is one of the most versatile and the most powerful of the programming languages, it is not the most commonly used. COBOL and FORTRAN have been available for a longer period of time than PL/I, and many more users work with those languages.

3. Questions:

1. What is the process of writing instructions called?
2. What is a code?
3. How must instructions be written?
4. What is the foundation of any programming language?
5. How was the development of programming languages progressing throughout the years?
6. What are the most common problem-oriented languages?
7. What is COBOL?
8. What functions was COBOL designed for?
9. What does FORTRAN serve for?
10. What capabilities has PL/I?

4. Sum up the contents of the text.

TEXT 15

1. Vocabulary:

word processing — обработка текста
telephone dialing — набор номера телефона
security — безопасность; охрана
appliance — устройство; прибор
maintenance — поддержание; сохранение; эксплуатация
application software — прикладные программы
to delete — удалять; стирать; очищать память
to move paragraphs around — менять местами абзацы
accountant — бухгалтер
accounting — бухгалтерский учет
income tax — подоходный налог
stock market forecasting — биржевые прогнозы
worksheet — электронная таблица
scheduling — составление расписания, графика
computer-assisted instructions — компьютерные команды
to meet the demands — удовлетворять потребности
record keeping — регистрация; ведение записей
grading — оценивание; классификация

2. Read and translate the text.

APPLICATION OF PERSONAL COMPUTERS

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

Home and hobby. Personal computers enjoy great popularity among experimenters and hobbyists. They are an exciting hobby. All hobbyists need not be engineers or programmers. There are many games that use the full capabilities of a computer to provide many hours of exciting leisure-time adventure.

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

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

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

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

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

3. Questions:

1. What are the main spheres of PC application?
2. Do you enjoy computer games?
3. Is it necessary for a person to be an analyst or a programmer to play computer games?

4. What other home and hobby applications, except computer games, can you name?

5. What is "a word processing program"?

6. What possibilities can it give you?

7. Can you correct mistakes while typing any material and how?

8. What other changes in the typed text can you make using a display?

9. Which professions are in great need of computers?

10. How can computers be used in education?

4. Reproduce the main points of the text.

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