МИНИСТЕРСТВО ОБРАЗОВАНИЯ РОССИЙСКОЙ ФЕДЕРАЦИИ

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КОМПЬЮТЕРНАЯ ТЕХНИКА

Методические указания по английскому языку.

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Методические указания предназначены для использования на занятиях по английскому языку со студентами 2 курса факультета информационных технологий. Данная работа представляет собой подборку текстов и систему упражнений к ним. Упражнения рассчитаны на закрепление навыков чтения и перевода, а также на развитие лексических и разговорных умений и навыков.

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Введение

Настоящее пособие предназначено для студентов II курса института информационных технологий. Основной целью пособия является подготовка студентов к самостоятельному чтению на английском языке оригинальной технической литературы по специальности.

Цели методических указаний:

а) развить навыки и умения чтения оригинальной литературы по специальности;

б) развить лексико-грамматические навыки;

в) развить умение аннотирования и реферирования оригинальных текстов по специальности.

Тематический отбор материала позволяет широко ознакомить студентов с терминологией по данной специальности. Пособие состоит из 7 разделов, включающих основной текст для изучающего чтения, дополнительный текст для чтения с общим охватом содержания. Имеющиеся в конце последнего раздела тексты предназначены для самостоятельной работы со словарём. Послетекстовые упражнения построены преимущественно на лексике текстов или предложениях взятых из текста, что обеспечивает повторяемость лексики.

В словарь включена общетехническая и терминологическая лексика основных текстов пособия.

1 Unit I

1.1 Text 1 What is a computer?

1.1.1 When you read the following text, try to understand the meaning of the new words from the context. When you have read the whole text, check the new words in a dictionary. Those words underlined are explained in the glossary or in the list of terms.

One of the most spectacular developments of this century is the computer, a machine, which performs long sequences of calculating and reasoning operations at great speed and with vast reliability. As a consequence, there is now at the service of man a power of over 200 billion calculating operations per second, supplementing the thinking and the memory of man. The basic job of computers is the 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, is kept inside the computer in a place called memory.

Computers are thought to 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, mu1tiplication and exponentiation.

Second, computers have means of communicating with the user.

Some of the most common methods of inputting information are to use punched cards, magnetic tape, disks and terminals. The computer's input device (which might be a card reader, a tape drive or disk drive, depending on the medium used in inputting information) reads the information into the computer. For outputting information, two common devices used are a printer which prints the new information on paper, or a CRT display screens which shows the results on a TV – like screen. Third, computers have circuits, which can make decisions. The computer can decide three things, namely: Is one number less than another? Are two numbers equal? And, Is one number greater then another?

1. 2 Exercises

1.2.1 In the following sentences the definitions have been mixed up. Write out the definitions correctly

1) Silicon is the information that is inputted with the program and which mathematical and logical operations are performed.

2) Program is a non-metallic element with semiconductor characteristics.
3) Data is a list of instructions, which are used to the computer to solve a problem.
4) A card reader is a device used for outputting information.
5) A display screen is a machine, which performs calculating and reasoning operations at great speed and with vast reliability.
6) A computer is a device used for inputting information.

1.2.2 Which statement best expresses the main idea of the text

1) Computers have many remarkable powers.
2) The program tells computer what to do.
3) Instructions and data must be given to the computer to act on.
4) Computers are machines capable for performing long sequences of calculating and reasoning operations at great speed with vast reliability.

1.2.3 Find the passages in the text where the following ideas are expressed

1) The basic job of computers is the processing of information.
2) Computers accept information in the form of instructions called a program.
3) The program tells computer what to do.
4) Computers have three basic capabilities.
5) Programs may be very fast.

1.2.4 Decide whether the following statements are true or false by referring to the information in the text

1) A computer can store or handle any data even if it hasn't received information to do so.
2) All computers accept and process information in the form of instructions and characters.
3) The information necessary for solving problems is found in the memory of the computer.
4) Not all computers can perform arithmetic operations, make decisions, and communicate in some way with the user.
5) Computers can still be useful machines even if they can't communicate with the user.
6) There are many different devices used for feeding information into computer.
7) There aren't as many different types of devices used for giving results as there are for accepting information.
8) Computers can make any type of decision they are asked to.
9) Computers can replace a human being in any kind of job.
10) A program is a form of instruction.

1.3 Text 2

1.3.1 When you read the following text, try to recognize the words of Text 1 and to understand new words from the context. Don't check new words in the dictionary until you have read the whole text. Words underlined are explained in the Glossary or in the List of Words

Computers are extraordinarily simple machines conceptually. Handling or manipulating the information that has been given to the computer in such ways as doing calculations, adding information or making comparisons is called processing. All computers have several characteristics in common, regardless of make or design. Information, in the form of instructions and data, is given to the machine, after which the machine acts on it, and a result is then returned. A common kind of general purpose digital computer can be thought of as very like a railroad system with stations, a control tower, tracks, switches , telegraph lines, and freight cars. The freight cars are loaded with information and they travel through the system almost at the speed of light. The information presented to the machine is the input; the internal manipulative operations, the processing; an the result, the output.

These three concepts of input, processing and output occur in almost every aspect of human life whether at work or at play. For example, in clothing manufacturing, the input is the pieces of cut cloth, the processing is the finished garment.

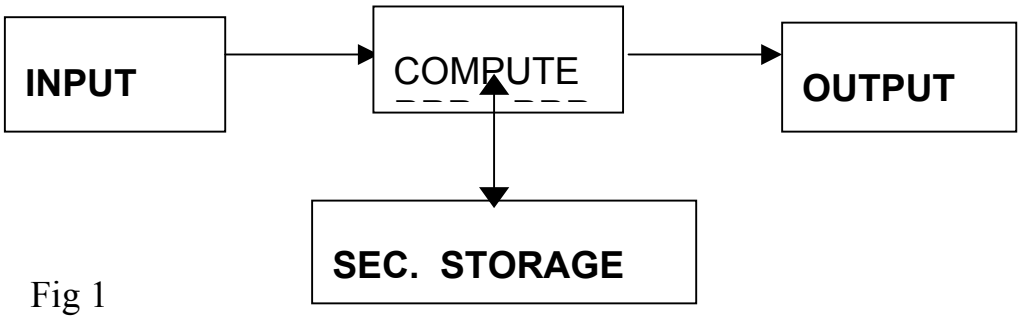


Fig 1

Fig.1 shows schematically the fundamental components in a computer system. The centerpiece is called either the computer the processor, or, usually the central processing unit. (CPU).

The term “computer” includes those parts of hardware in which calculations and other data manipulations are performed, and the high-speed internal memory in which data and calculations are stored during actual execution of programs. Attached to the CPU are the various peripheral devices such as card readers and key- boards. When data programs need to be saved for long periods of time, they are stored on various secondary memory devices or storage devices such as magnetic tapes or magnetic discs.

In the late 1950s and early 1960s when electrical computers of the kind in the use today were being developed, they were expensive to own and run. Moreover their

size and reliability were such that a large number of support personnel were needed to keep the equipment operating. This has all changed now that computing power has become portable, more compact and cheaper.

1.4 Exercises

1.4.1 Give definitions for the following. Use the definition formulae (consult Text 1)

Digital computer, processing, output, CPU, storage device.

1.4.2 Which statements best express the main idea of the text?

1. Computers have changed the world in which we live.
2. All computers have an input, a processor, an output and a storage device.
3. Computers have decreased man's workload.
4. All computers have the same basic hardware components.
5. The information presented to the machine is the input.

1.4.3 Find the passages in the text where the following ideas are expressed

1. All computers are basically the same.
2. Then arithmetic and/or decision-making operations are performed.
3. All the equipment used in a computer system is the hardware.
4. Computers are electronic machines used for processing data.
5. If programs or data need to be kept for a long time, they are stored on tapes or disks.
6. First the computer accepts data.
7. Finally, new information is presented to the user.

List of words and word-combinations for Unit 1

Text 1

1. spectacular development	*захватывающее событие*
2. long sequence	*последовательный ряд*
3. reasoning operation	*логическая операция*
4. vast reliability	*большая надежность*
5. as a consequence	*вследствие*
6. at the service of	*к услугам*
7. thinking and memory	*мышление и память*
8. to accept information	*принимать информацию*

9. to perform operations	*выполнять действия*
10. to provide information	*обеспечивать информацией*
11. to supply results	*снабжать результатами*
12. to solve problems	*решать задачи*
13. remarkable powers	*замечательные возможности*
14. basic capabilities	*основные возможности*
15. common methods	*общие методы*
16. to read information	*считывать информацию*
17. to make decisions	*принимать решения*

Text 2

1.	to handle information	*обрабатывать информацию*
2.	to manipulate information	*управлять информацией*
3.	to do calculations	*делать вычисления*
4.	to add information	*добавлять информацию*
5.	to make comparisons	*делать сравнения*
6.	regardless of make	*независимо от модели*
7.	to return result	*выдать результат*
8.	control tower	*башня пункта управления*
9.	a track	*дорожка*
10.	a switch	*ключ*
11.	a freight car	*грузовой вагон*
12.	manipulation operations	*операции управления*
13.	a piece of cut cloth	*отрез ткани*
14.	to sew together	*сшивать*
15.	a finished garment	*готовая одежда*
16.	to store gate	*хранить данные*
17.	actual execution	*действительное выполнение*
18.	to own and run	*владеть и управлять*

2 Unit II

2.1 Text 1

2.1.1 Read and translate the following text

COMPUTER SYSTEM

In order to use computers effectively to solve problems in environment, computer systems are devised. A “system” implies a good mixture of integrated parts working together to form a useful whole. Computer systems may be discussed in two parts.

The 1-st part is hardware – the physical, electronic and electro-mechanical devices that are thought of and recognized as “computers”.

The 2-nd part is software – the programs that control and coordinate the activities of the computer hardware and that direct the processing of data.

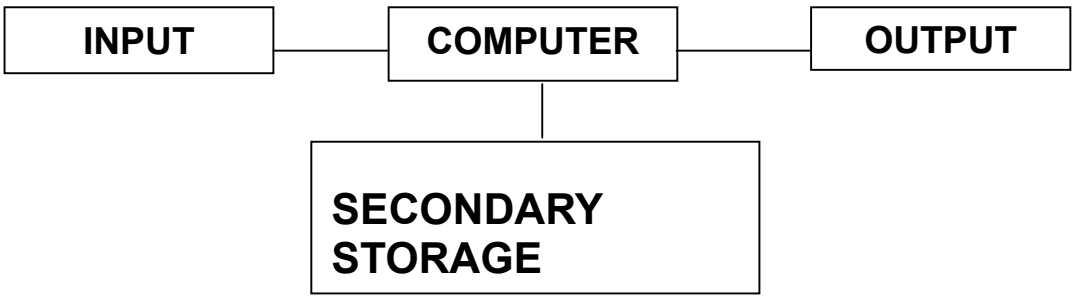


Fig.2 - Hardware components of a basic computer system

Fig.2 shows diagrammatically the basic components of computer hardware joined together in a computer system. The term “computer” usual refers to those parts of the hardware in which calculations and other data manipu1ations are performed, and to the internal memory in which data and instructions are stored during the actual execution of programs.

The various peripherals, which include input and/or output devices, various secondary memory devices, and so on, are attached to the CPU. Computer software can be divided into two very broard categories – systems software and application software. The former is often simply referred to as “systems”. These, when brought into internal memory, direct the computer to perform tanks. The latter may be provided along with the hardware by a systems supplier as part of a computer product designed to answer a specific need in certain areas. These complete hardware/software products are called turnkey systems.

2.2 Exercises

2.2.1 Which statement best expresses the main idea of the text

1.Only hardware is necessary to make up a computer system.
2.Software alone doesn't constitute a computer system.
3.A computer system needs both hardware and software to be completed.

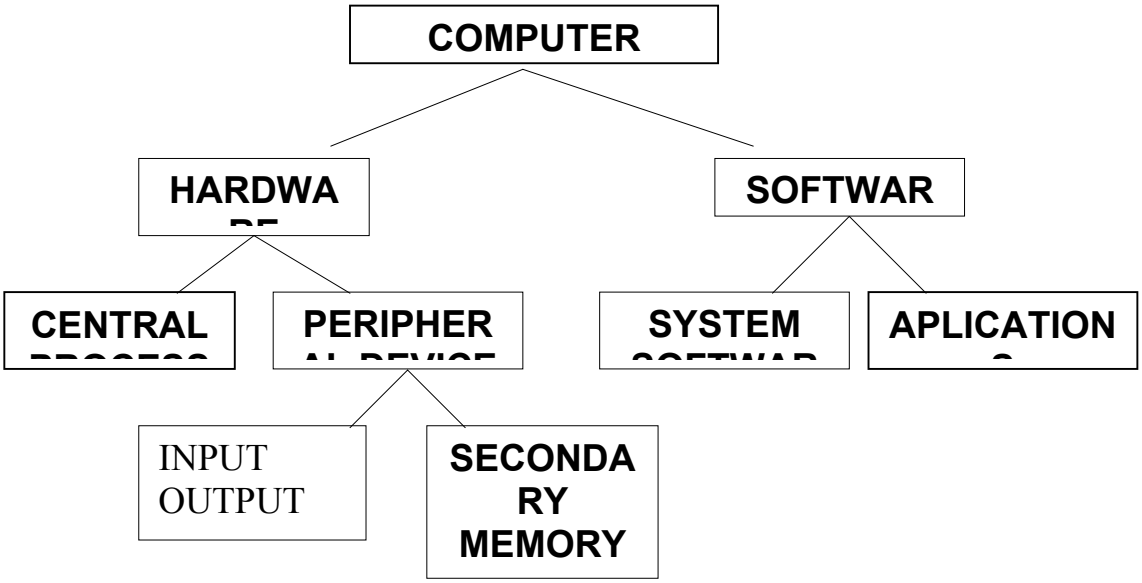
2.2.2 Find the passages in the text where the following ideas are expressed

1.The hardware consists of the physical devices of the computer.
2.The success or failure of a computer system depends on the proper mixture of hardware and software.
3.Computer software can be devided into 2 parts.
4.The software is the programs.

2.2.3 Match the words in column A with the words or statements in column B

A	B
2) hardwar e	2) short for central processing unit
	b) hardware plus software
2. software	c) the program
3. processor	g) the computer
4. turnkey systems	e).physical electronic and electromagnetic devices
5. CPU	

2.2.4 Use the following diagram to complete the paragraph



A computer system consists of two components: … and … . Each component is subdivided into different parts. The Central Processing Unit and the … constitute the … component. System software and … comprise the …. … . Devices that are used

for secondary storage are considered part of the … component. These devices along with Input and Output devices are referred to as … devices.

2.3 Home exercises (to be done in writing)

2.3.1 Read and translate the following text in to Russian

Application

Railways use large computer systems to control ticket reservations and to give immediate information on the status of trains. The computer system is connected by private telephone lines to terminals in major train stations and ticket reservations for customers are made through there. The passenger's name, type of accommodation and the train schedule is put into computer's memory.

On a typical day, a railway's computer system gets thousand of telephone calls about reservations, space on other railways, and requests for arrivals and departures.

A big advantage of the railway computer ticket reservation system is its rapidity because a cancelled booking can be sold. Here in the system just a fee seconds later. Railway computer systems are used not for reservations alone. They are used for variety of other jobs including schedule, planning, freight and cargo loading, meal planning, personnel availability, accounting and stock control.

It is the incredible speed of computers along with their memory capacity that make them so useful and valuable. Computers can solve problems in a fraction of the time it takes man. For this reason businesses use them to keep their accounts, and airlines tramlines and business use them to keep track of ticket sales. As for memory, modern computers can store information with high accuracy and reliability. A computer can put data into its "memory" and retrieve it again in a few millionths of a second. It also has a storage capacity for as many as a million items.

2.3.2 Translate the following article with the help of a dictionary

Apple launches a new product

As the spokesman for the company put it, "Newton" is the father of a whole family of information accumulation and transmission devices, the production of which is based on the unique elements software and base. The basis of the electronic part is ARM 610 Risc-processor (volume PZU-4 МЬ, OZU-640 kb). The "Newton Mail" software package is also on offer.

In essence "Newton" is not a computer, but an electronic notebook and fax machine all in one. What is more, the new machine is sophisticated and quick enough to preserve information into it, and even to classify data and transmit numbers fed into its memory in advance to addresses, telephones and fax machines automatically.

"Newton" fits easily into a pocket or folder. The devise may be operated with an electronic "pen", with which the user writes information required or the idea that struck him on the display. If the information is meant for specific person, it is

sufficient to key in just his name and “Newton” will then locate his address in the memory and transmit information along the telephone or fax number. In addition, “Newton” can easily be connected to the telephone network, personal computer and any other means of communication.

An important peculiarity of “Newton” is that it only reacts when its owner keys in the information. Such “recognition” of keying is possible thanks to the programmes which the US firm specially ordered from Russia’s programmers. In the USA “Newton” is already on sale, with a price of 700 to 900 dollars depending оп its possibilities. The first “international” samples of “Newton”, on which one can work in English and in other languages, had already appeared by early September.

List of words for Unit2

1	in order to	*для того, чтобы*
2	environment	*окружающая среда*
3	to devise	*изобретать*
4	to imply	*подразумевать*
5	to direct	*направлять, адресовать*
6	to join (together)	*соединять*
7	to refer to	*относиться к*
8	to attach	*присоединять*
9	to provide along with	*обеспечивать вместе с*
10	to answer a (specific) need	*Удовлетворять (специфическую) необходимость*
11	immediate	*безотлагательный*
12	to connect	*соединять*
13	major	*главный*
14	a customer	*клиент*
15	type of accommodation	*тип места в поезде*
16	a schedule	*расписание, график*
17	request	*запрос*
18	arrivals and departures	*прибытия и отправления*
19	a big advantage	*большое преимущество*
20	a cancelled booking	*отмененный, предварительный заказ*
21	freight and cargo loading	*погрузка различного груза*
22	availability	*наличие*
23	accounting	*счётное дело*
24	stock control	*контроль фондов (запасов, ценных бумаг)*
25	incredible	*невероятный*
26	to keep account of	*вести счет*
27	to keep track of	*прослеживать*
28	as for	*что касается*
29	high accuracy	*высокая точность*
30	to retrieve	*увлечь*

31 . to retrieve *увлечь*

2.4 Text 2

2.4.1 Read and translate the following text.

Computer As Tools For Marketing

Since 1975 the personal computer (PC) has changed the world of business. In the past, the slide ruler, adding machine, the telegraph, the telephone, the hand calculator and the airplane each greatly affected the way business is done. Today the computer has begin to greatly affect the marketing field.

Computer programs are now available for collecting assessing and analyzing data and even projecting or predicting the future based upon current trends. Some programs have been developed that can simulate potential market conditions so that marketers can pretest strategies. These were mostly experimental but within a very short time they became as commonly available as PC's are today.

With the use of telephone modems, connected to PC's and computer printers and data base marketers today can assess information about any market, segment of market, even specific buyer anywhere in the world right from their own office.

Computer software is now available to write data collecting questionnaires, job interview forms, analyze advertising media effectiveness, sales and marketing management, create graphs and charts for analysis of market trends.

Words:

1.	**slide ruler**	***логарифмическая линейка***
2.	**modem**	***модем***
3.	**questionnaire**	***вопросник, анкета, опросный лист***
4.	**chart**	***схема, таблица, чертеж***

2.5 Exercises

2.5.1 Answer the following question

1. What inventions had a revolutionary effect on business management ?

2. Why is PC the most effective tool for marketing now?

3. What computer programs are now available to assist a manager?

4. Why is it very important for a marketing manager to simulate potential market conditions?

5. What is the practical application for computer programs?

2.5.2 Round – table discussion

Take part in a seminar conducted by analysis from the USA, Great Britain. The motto of the seminar – "Computers and Marketing " share your experience on the use of computers in your executive work with the participants of the seminar.

2.5.3 Home exercise
Write a short summary of the following text in English

Аппаратное и программное обеспечение

Аппаратное обеспечение или просто аппаратура (Hardware) термин, закреплённый за электронными и механическими устройствами компьютера. Все основные устройства компьютера – его центральный процессор, арифметическо-логическое устройство, вывода и ввода, запоминающее устройство – всё это относится к аппаратному обеспечению.

К нему же можно отнести также клавиатуру, с помощью которой оператор вводит программу в ЭВМ, дисплей для отображения информации в виде букв, цифр и различных знаков на экране электронно-лучевой трубки (экрана телевизора), различные печатающие устройства, интерфейс-устройство, управляющее потоком информации и форматом между электронной вычислительной машиной и внешними устройствами.

К программному (или математическому) обеспечению (Software) относятся собственно программы. Меняя программы, можно одну и ту же ЭВМ заставить выполнять различные функции. Например, с помощью одной программы ЭВМ может работать со студентами в диалоговом режиме, при котором она задаёт студенту вопросы, на которые он должен дать правильные ответы.

В случае ошибочных ответов компьютер даёт консультацию и просит студента ответить ещё раз и т.д., с помощью третьей - управлять каким – то процессом, меняя программы, можно использовать компьютер для регистрации деловых бумаг, выписки счетов на оплату. Широкое распространение, особенно в домашних бытовых компьютерах, получили программы для телевизионных игр, позволяющие использовать их для досуга и развлечения. Вводя ту или

иную программу, можно играть с компьютером в шахматы или шашки. И всё это при одном и том же компьютере. Программному обеспечению в настоящее время придаётся очень большое значение, издаются целые сборники программ, программы защищаются наравне с литературными произведениями специальными органами охраны авторских прав. Без программного обеспечения компьютер мёртв.

3 Unit III

Kinds of computers

Using information of the four texts given below, be ready to speak on usage, characteristics, advantages (disadvantages) of different types of computers.

3.1 Text 1

Introduction

Three classes – Every computer has a processor, memory and some type of I/0. From there computers can be classified as microcomputers, minicomputers, or mainframes. Each class overlaps the other. Generalized definitions of the three follow.

A microcomputer contains a microprocessor, usually located on one LSI (large-scale imtergrated) chip or small LSI chip set. The processor's word length is between 4 and 8 bits.

Most microcomputers have at least 256 words of memory. A minicomputer's word length is between 12 and 16 bits. And its minimum memory size is 4 OS'6 word4.

A mainframe, or so called large computer, usually has a word length of 52 bits or more and a minimum memory of l6 384 words.

3.2 Text 2

Mainframes

Large computer systems, or mainframes, are those computer systems found in computer installations processing immense amounts of data. They make use of very high-speed main memories into which data and programs to be dealt with are transferred for rapid access. These powerful machines have a larger repertoir of more complex instructions which can be executed more quickly. Where a smaller computer may take several steps to perform a particular operation, a larger machine may

accomplish the same thing with one instruction.

These computers can be of two types: digital or analog. The digital computer or general-purpose computer as it is often make up about 90% of the large computers now in use. It gets name from the name of the data that are presented to it and which consist of digits. The digital computer can do calculations in steps at tremendous speed and with great accuracy. Digital computer programming is by far the most commonly used in electronic data processing for business or statistical purposes. The analog computer works something like a car speedometer, in that it continuously works out calculations. It is used essentially for problems invo1ving measurements. I t can simu1ate or imitate different measurements by electronic means. Both of these types are made of electronic computers that may require a larger room to accommodate them. At present, the digital computer is capable of doing anything the analog once did. Moreover, it is easier to program and cheaper to operate. A new type of scientific computer system called the hybrid computer has now been produced that combines the two types into one.

3.3 Text 3
Minicomputers

Until the mid – 1960s, digita1 computers were powerful, physically large and expensive . What was rea11yneeded were computers of less power, a smaller memory capacity and whiteout such a large array of peripheral equipment. This need was partially satisfied by the rapid improvement in performance of the semiconductor devices (transistors), and their incredib1e reduction in size, cost and power – a11 of which led to the development of the minicomputer or mini for short.

Although there is no exact definition of a minicomputer, it is generally understood to refer to a computer whose mainframe is physically small, and has a fixed word length between 8 and 32 bits.

A large number of peripherals hove been developed especially for use in systems built round minicomputers. They include magnetic tape, cartridges and cassette, small disk units and a large variety of printers and consoles.

Since the operating environment for most minis is far less varied and complex

than large mainframes, it goes without saying that the software and peripheral requirements differ greatly from those of a computer which runs several hundred ever-changing jobs a day. The operating systems of minis alsousually provide system access to either a single user or to a limited number of users at a time.

Since many minis are employed in real-time processing, they are usually provided with operating systems that are specialized for this purpose. Because minicomputer systems have been used so often in real-time applications, other aspects of their design have changed; that is, they usually possess the hardware capability to be connected directly to a large variety of measurement instruments, to analog and digital converters, to microprocessors, and to an even larger mainframe in order to analyze the collected data.

3.4 Text 4

Microcomputers

The early 1970-s saw the birth of the microcomputer, or micro for short. The central processor of the micro, called the microprocessor, is built as a single semiconductor device; that is, the thousands of individual circuit elements necessary to perform all the logical and arithmetic functions of a computer are manufactured as a single chip. A complete microcomputer system is composed of a microprocessor, a memory and peripheral equipment.

The processor, memory and electronic controls for peripheral equipment are usually put together on a single or a few printed circuit boards. System using microprocessors can be hooked up together to do the work that until recently only minicomputers systems were capable of doing. Micros generally have samewhat simpler and less flexible instruction sets than minis, and are typically much slower.

Different micros are available with 4-, 8-, 16-bit word lengths. Similarly minis can be equipped with much larger primary memory sizes, micros are becoming more powerful and converging with minicomputer technology.

In addition to their extensive use in control systems of all types, they are destined for many new uses from more complex calculators to automobile engine operation and medical diagnostics. They are already used in automobile emission control systems

the basis of many TV game attachments. There is also a rapidly growing market for personal computers whose application potential in education is only just beginning to be exploited.

3.5 Exercises

3.5.1 Summarize the texts on "Mainframes", "Minicomputers" and "Microcomputers" by completing the following table 1

Table 1

Kinds of computers		
1	2	3
Mainframes	Minicomputers	Microcomputers
When developed Usage		in the 70-в in fixed applications
Memory speed and capacity	Most primary memory ranges from32 – 512 k bits	
1	2	3
Size		Small portable size
Complexity of instructions	very complex instructions which can be executed quickly	
Number of users		Single user-personal computer
Type of processing	a11ows batch as well as real-time processing	

3.5.2 Write an abstract of the following text in Russian.

Automated designer

A system of computer – aid designing for the Uralmash production association is being developed at the Heavy Engineering Research Institute in Sverdlovsk (an industrial centre in the Urals)

The Uralmash is a major producer of sophisticated and sometimes unique equipment. Designing and calculations, development components, assemblies and processes, the designing of new tools will now be taken over by the computer.

List of words and expressions for UNIT 3

Text 1

1. i/o –input/output	*ввод/вывод*
2. to classify smith as smith	*классифицировать что-либо как что-либо*
3. to overlap	*перекрывать*
4. a set	*набор*
5. at least	*по крайней мере*

Text 2

1. immense amounts of data	*огромное количество данных*
2. to take use of	*использовать*
3. to be dealt with	*быть занятым чем-либо*
4.to transfer for rapid access	*передать для быстрого доступа*
5. a repertoir	*набор (команд)*
6. to be executed	*быть выполненным*
7. to accomplish	*выполнять*
8. to make up	*составлять*
9. tremendous speed	*огромная скорость*
10.to work out	*вырабатывать*
11.to simulate	*моделировать*
12.means	*средства*
13.essentially	*главным образом*
14.to involve	*включать измерения*
15.to require	*требовать*
16.to accommodate	*разместить*
17.to be capable of doing nuth	*быть в состоянии что-либо сделать*

Text 3

1. expensive	*Дорогой*
2. a large array of	*множество, большое количество*
3. to satisfy the need	*удовлетворить потребность*
4. performance	*работа*
5. to lead to	*привести к*
6. for short	*в сокращенном варианте, виде*
7. exact	*точный*
8. to refer to	*относиться к*

9. it goes without saying	*само собой разумеется*
10.to differ from	*отличаться от*
11.to run	*(зд.) выполнять*
12.to provide access to	*обеспечить доступ к*
13.a user	*пользователь*
14.at a time	*за один раз*
15.to process	*обладать*

Text 4

1. to be composed of	*состоять из*
2. to de hooked up together	*быть сцепленным, собранным*
3. flexible	*гибкий*
4. instruction sets	*наборы инструкций*
5. to be available	*имеется, быть доступным*
6. to converge	*сходиться*
7. to be destined for	*предназначаться для*
8. emission control	*системы контроля выхлопных газов*
9. tv game attachments	*телевизионные игровые приставки*

4 UNIT IV

The computer revolution

"The computer, with its promise of a millionfold in man's capacity to handle information, will undoubtedly have the most far-teaching social consequence of any contemporary technical development. The potential for good in the computer and the danger inhexent in its misuse exceed our ability to imagiae… . We have actually entered a new era of evolutionary history, one in which rapid change is a dominant consequence. Our only hope is to understand the farces at work and to take advantage of the knowledge we find to guide the evolutionary process."

Dr. Jerome B. Weisner

4.1 The paper says that the 21st century would be impossible without the computer. Do you think the same way ? What reasons does the author give in favor of his opinion? Read the passage below attentively and find all the fact in favor of the idea.

Without the computer space programs would be impossible and the 21st century would be impossible. The incredible technology we are building, the complexity and the knowledge we are amassing on the way toward the creation of that not-so-far-off 21st century, are all beyond the unaided mind and muscle of man. More that any other single invention, perhaps even more that wheel, the computer offers a promise so dazzling and a threat so awful that it will forever change the direction and meaning of our lives.

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

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

Even before a rocket is launched, it is flown from ten to a hundred times through space-computer-simulated space – on flights constructed of mathematical symbols, on trajectories built of information bits, encountering hazards that are numbers without

menace. For one of the computer's greatest assets is its ability to simulate one or a million variants of the same theme. "What if?" is the question the computer can answer accurately, swiftly, and over and over again. From this variety of possibilities, a trip from the earth to the moon can be simulated as often as necessary, with every possible trajectory plotted and every mile of the journey through space marked with symbolic signposts that will provide assurance that, mathematically at least, man has travelled this way before.

The computer can do far more than simulate the mechanics of space flight; it can furnish accurate models of life itself. In computer simulation, then, there may come the great breakthrough needed to convert the inexact social sciences – the studies of man as a social being – into exact science. For the sociologist the problem has always been the lack of an adequate yardstick by which to measure and count. The one absolutely essential tool of science is the measuring device. Anything that can be counted, measured, quantified, can be studied with scientific accuracy. Now it becomes possible to perform controlled experiments, in which every factor that goes in is known in advance and the answers that come out are then valid.

With computer simulation you can have a series of problems in which you can figure out all the ramifications, all the per mutations and combinations, and do it very quickly and know the different combinations that are at stake. So you can use it really as a means of controlled experiment. You can get a computer model of a city and play out all the different effects, so that if you decide, for example, to relocate traffic in one way you can trace out very quickly, on the model, the effects on industry locations, residential densities, and the like. And more important, when you have alternative plans of this kind you can then choose, and that is the fundamental aspect of all such notions of planning. It allows you to have a sense of wider choice, to see therefore, the consequences of it and say, I prefer this, scheme rather than another.

4.2 Exercises

4.2.1 Look through the passage carefully and find the English equivalents for the following Russian phrases:

невероятная технология; невооруженный разум и мышцы; ослепительные обещания (надежды); ужасающая угроза; смысл нашей жизни; задачи маневрирования, задачи возвращения в атмосферу; столкнуться с опасностью (риском); безопасно; одно из величайших ценных качеств; даст уверенность; показывает угловое пространственное положение; до запуска двигателей реактивной системы.

4.2.2 Read the passage and find answers to the following questions:

1. Do you think that the 21st century would be impossible without computers? 2. Why do you think so? 3. Why is the 21st century impossible without space programs? 4. What does the author mean by incredible technology beyond the unaided mind? 5. What does the author mean by aided or unaided muscle? 6. What docs the computer promise in future? 7. Why can the threat of computers be so awful? 8. Can you give any examples of a computer hazard? 9. What walks of life has the computer founds applications in? 10. What control operations does the computer provide in aircraft and space flights? 11. What possibilities does the computer provide in simulating the mechanics. of space flights? 12. Why is the computer an essential tool in social sciences? 13. What problems can the computer simulate and solve in city planning?

4.2.3 Write a short summary on text I

4.3 Text II

Read the passage as fast as you can (5 minutes are preferable) and say about the computer applications mentioned in the text.

Some new words: microfiche ['maikroufi (:) J] *n информ.* микрофиша (карточка с несколькими кадрами микрофильма); descendant *n* потомок; thief [6i:f] *n* вор

Computers concern you

When Charles Babbage, a professor of mathematics at Cambridge University, invented the first calculating machine in 1812 he could hardly have imagined the situation we find ourselves in today. Nearly everything we do in the modern world is helped, or even controlled, by computers, the complicated descendants of his simple machine. Computers are being used more and more extensively in the world today, for the simple reason that they are far more efficient than human beings. They have much better memories and can store huge amounts of information, and they can do calculations in a fraction of the time taken by a human mathematician. No man alive can do 500,000 sums in one second, but an advanced computer can. In fact, computers can do many of the things we do, but faster and better. They can *pay wages,* reserve seats on planes, control machines in factories, work out tomorrow's weather, and even play chess, write poetry, or compose music. Let's look now at some of their ways in which computers concern people in their daily lives and work.

Chief inspector Harston talks about ways in which computers can help the police fight crime. Members of the public often think of detective work as fast and exciting when most of it is *slow and boring.* '"For example, a detective on *a stolen car* case may have to check through long lists of information, and in the time it takes him to do this the thief may well escape. With the new National Police Computer we

are now able to find out details of car ownership and driving licences in a fraction of the time it takes by traditional methods. In police work speed is often essential, so computers are ideal for helping us catch criminals.

Many people associate computers with the world of science and maths, but they are also a great help to *scholars* in other subjects, in history, literature and so on. It's now possible for a scholar to find a book or article he needs very quickly, which, when a million or more new books are published each year, is *quite an advantage.* There's a system, controlled by computer, of giving books a code number, reducing them in size by putting them on microfiche, and then storing 3,000 or more in a container no bigger than a washing machine. You tell the computer which subject you're interested in and it produces any microfiche you need in, seconds. It's rather like going to an expert who has read all the works on your subject and can remember where to find the correct information, which few human experts can! There are also systems being developed to translate articles from foreign magazines by computer, and to make up the many lists of information that are needed in a modern library. So computers can help us to deal with the knowledge explosion in many ways.

4.4 Exercises

4.4.1 The article can be divided into three parts. Where would you divide it? What is each part about? Title each of the three paragraphs

4.4.2 Try to guess the meaning of the words given in italics in the text

4.4.3 Translate the sentences marked with an asterisk

4.5 Home exercises (to be done in writing)

4.5.1 Translate the following sentences into Russian. Pay special attention to *rather than* "а не; вместо того, чтобы".

1 I prefer this techniques rather than that commonly used before. 2. Most researchers prefer the procedure we followed rather than the one used earlier in similar studies. 3. They made this experiment with a view to determine the area of contact rather than the rate of these exchanges. 4. The experiments were planned to check the hypothesis rather than to demonstrate the results obtained. 5. Experiments of this kind are highly reliable rather than. just very simple and elegant. 6. We will use the newly developed procedure rather than the conventional one. 7. Only one explanation other than given originally by other authors has been put forward to explain, this phenomenon. 8. We

prefer to deal with this problem rather than any other.

4.5.2 Translate the following sentences into English. Follow the model

Model:	Я бы предпочел остаться дома, а не идти в кино	I would rather stay at home than go to the cinema.
1.	Я бы предпочел поговорить с вами лично, а не с вашим другом.	
2.	Я бы предпочел следовать вашим советам, а не чьим-то еще.	
3.	Я бы предпочел встретиться с вами лично, а не говорить по телефону.	
4.	Я бы предпочел присоединиться к вашей научной группе, а не к какой-то другой.	
5.	Я бы предпочел работать под вашим руководством, а не под чьим-то еще	
6.	Я бы предпочел работать над этой проблемой, а не над какой-то другой.	

5 UNIT V

5.1 Text I

Translate the passage at sight

Some new words: retrieve *v* отыскивать; justify *v* подтверждать; schedule *v* составлять график, таблицу; setting *n зд.* окружение; rule of thumb практическое правило, эмпирическое правило

Artificial intelligence

Expert systems are a class of computer programs that can advise, analyse, design, diagnose, explain, explore, forecast, form concepts, identify, interpret, justify, learn, manage, monitor, plan, present, retrieve, schedule, test and tutor. They address problems normally thought to require human specialists for their solution. Some of these programs have achieved expert levels of performance on the problems for which they were designed.

Expert systems are usually developed with the help of human experts who solve specific problems and reveal their thought processes as they proceed. If this process of protocol analysis is successful, the computer program based on this analysis will be able to solve the narrowly defined problems as well as an expert.

Experts typically solve problems that are unstructured and ill-defined, usually in a setting that involves diagnosis or planning. They cope with the lack of structure by employing heuristics, which are the rules of thumb that people use to solve problems when a lack of time or understanding prevents an analysis of all the parameters involved. Likewise, expert systems employ programmed heuristics to solve problems.

Experts engaged in several different problems—solving activities: identify the problem, process data, generate questions, collect information, establish hypothesis space, group and differentiate, pursue and test hypothesis, explore and refine, ask general questions, and make a decision.

As researchers of the domain point out a robust expert system that can explain,

justify, acquire new knowledge, adapt, break rules, determine relevance and behave as human experts do, will have to use a multitude of knowledge representations, that lie in a space whose dimensions include deep and surface (representations), qualitative/quantitative, approximate/exact, specific/general and descriptive/prescriptive representations.

Expert systems, like human experts can have both deep and surface representations of knowledge. Deep representations are causal models, categories abstractions and analogies. In such cases, we try to represent an understanding of structure and function. Surface representations are often empirical associations. With surface representations, all the system knows is that an empirical association exists; it is unable to explain why, beyond repeating the association. Systems, that use knowledge represented in different forms have been termed multilevel systems.

Work is just beginning in building such multilevel systems, and they will be a major research topic for this decade. Work needs to be done in studying and representing in a general way the different problem-solving activities an expert does. When you build expert systems, you realize that power behind them is that they provide a regimen (управление): for experts to crystallize and codify their knowledge and in the knowledge lies the power.

Answer the following questions based on the text:

1. What problems do expert systems usually solve? 2. How do they solve such problems? 3. Who can develop expert systems? 4. What do they call multilevel systems? 5. Why are multilevel systems of special interest?

5.2 Text II

Read the article carefully and answer the following questions: 1. What is the principle of the action of an optical switch? 2. How far arc we from an optical computer?

Europe leads research in optical computing

Until now, the switches inside computers have been electronic. European scientists are going to demonstrate the world's first optical computer. This

demonstration will come 22 years after the theory behind optical computers was first predicted by researchers from the computer company IBM. "However, there is still a large gap between what theoretical physicists believe can be done, and what electronic engineers know is possible.

In theory, optical switches leave their electronical counterparts standing. It is like comparing the speed of light with the speed of electricity. •"Optical switches are so fast and yet so small that an optical device of one square centimetre can resolve 10^7 separate spots of light and each can be switched on and off at a speed of 30 nanoseconds. This means that an optical device one square centimetre in area could, in theory at least, handle 3×10^{14} bits per second. This rate is equivalent to everybody in the world having a telephone conversation at the same time.

The optical switch works on the principle of optical "bistability". Usually, when a beam of light is passed through a transparent material, the relationship between the intensities of light entering and the light leaving is linear. However, under certain circumstances a non-linear relationship occurs. A small increase in the intensity of light entering the material leads to a much greater increase in the intensity of light leaving the material.

In optical switches, the material is placed inside a resonant cavity. In practice, this means that the edges of the material are highly polished and parallel to each other. With such materials some of the light entering becomes "trapped" inside as it bounces back and forth against each polished surface. In other words, it resonates. This changes the refractive index of the material, with the result that for a given intensity of light entering the switch are two possible intensities of light leaving it.

In other words, there is the equivalent to an "off" position and an "on" position because there are two stable states and the material shows optical bistability. Up to now a switching speed of $10'^{13}$ seconds has been achieved, although the power needed to generate this is in the kilowatt range. A speed of one nanosecond ($10"^{9}$) is possible in the milliwatt power range.

5.3 Exercises

5.3.1 Translate the sentences marked with an asterisk

5.3.2 Think and say about

a) theoretical suppositions behind optical computers;
b) practical achievements in the field.

5.4 Home exercises (to be done in writing)

5.4.1 Translate into Russian

The Importance of How We Calculate

1. In theoretical physics, the distinction between a fundamental innovation and mere (простой) progress in calculating the consequences of an existing theory is subtle (неуловимый). It is rare that a scientist begins a theoretical analysis with the notion that it will require revolutionary new ideas. Usually scientists will begin with accepted knowledge and try to work out its consequences. When the result of a calculation differs from what is observed, it is difficult o decide whether to change the theory or the method of calculation, unless we know that the calculation offers accurate picture of what the underlying theory implies.

2. For example, physicists believed for many years that heir inability to make much progress toward a theory of subatomic particles was due to the lack of good calculation methods for dealing with their equations. After the equations were changed to conform with new ideas, however, it was bound that the old calculation methods were adequate-provided they were applied to the right equations.

5.4.2 Translate into English. Use either the word *experiment or experience*

1. Я полагаюсь (to rely upon) на свой собственный опыт.
2. Опыт обычно длится несколько часов.
3. Я это знаю по (by) опыту.
4. В результате наших исследований мы приобрели (to gain) большой опыт.
5. У нас большой опыт научной работы.
6. Результаты опыта будут опубликованы.
7. Повседневный опыт показывает, что вы не правы.
8. Нам не удалось провести дополнительные опыты.

6 UNIT VI

6.1 Text I

Read the passage carefully and answer the question:

How many and what means of increasing computer speeds are mentioned in the text?

The future of computers

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

Computers must still be programmed for every action they take which is a great limitation. How quickly the programmer can tell it what to do becomes a major drag on computer speeds. The time lag can be shortened by linking up different computers and designing more efficient devices to jam information in and pull it out of the machine, but the basic limitation of the step-by-step program remains.

A means around this roadblock is called parallel processing. Instead of solving a problem by following step-by-step instructions of the program the arithmetic and memory units will break the main problem down into a number of smaller problems that will be solved simultaneously. Parallel processing was introduced into the fourth generation computer called ILLIAC IV named for the University of Illinois, where it was designed.

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

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

"rear view", "cross section", and so on. All the designer needs to do is to touch his light pen to the appropriate choice, and the computer does the rest. Similarly, the designer can circle any part of the drawing on the screen with his pen and request a blow-up—a large-scale drawing of just that part he has circled.

The end product of this man-machine design team is not a series of drawings on paper but a set of equations that precisely define every point of design. Eventually, these symbols will be fed to the production line machinery, which will translate the symbols into steel and glass forms of automobiles.

6.2 Exercises

6.2.1 Look through the passage and find the English equivalents for the following Russian phrases

акцент смещается на; обычно называемые; очень широко используется; повысим производительность в 10—20 раз; основной тормоз; запаздывание; потактовая программа; одно из средств обойти это препятствие; мало чего будут стоить без; серия вариантов выбора; справится с любой ситуацией подбора (методом проб и ошибок); гибкие средства коммуникации; множество вариантов; вид спереди; вид сзади; вид в разрезе; соответствующий выбор; запросить увеличить в размере; группа проектировщиков; человек-машина; серии чертежей; производственная линия.

6.2.2 Find in B the equivalents or words meaning more or less the same as the words in A

A.1. to drag; 2. to lag; 3. to jam; 4. to flash; 5. 'option; 6. to cope with; 7. to blow up; 8. roadblock

B. a) to pack tightly into a small space; b) right of choosing (choice); c) to deal successfully; d) an obstruction placed across a road to stop someone; e) to increase in size; f) to delay; g) to give out a sudden bright light; h) to pull.

6.2.3 Fill in the blanks with the information taken from the text or based on your own knowledge or thinking

1. The text concerns the problems of ... .
2. Further improvements in the performance and speeds of computers are achieved by means of ... .
3."Scalar" processors in supercomputers are replaced by ... and ... ones.
4."Vectorization" of calculations in high energy physics has improved the performance by ... .
5. A major drag on computer speeds is the problem of ... .
6.This problem can be coped with by ... .
7. Parallel processing is done by ... .
8. Man-machine communication can be greatly simplified and speeded up by ... .
9. Graphic computers are very useful in solving ... .
10. In a graphic computer the information is presented on ... and the scientist communicates with the computer by means of an ... .

6.2.4 Think and say about

a) the progress in increasing data processing;

b) graphic computers as the most flexible means of communication between man and machine.

6.3 Text II

What is your idea of computers-translators? Is the problem feasible today or not? Read the following passage and say whether the author is optimistic or skeptical about it? Find the facts to prove your idea.

Computers-translators

Foreign-language translation may prove to be just a bit more than computer *can handle.* From the Tower of Babel (вавилонское столпотворение) on there have been *countless examples* of man's inability to understand man. What hope is there

then for a machine to understand man, or even another machine? Machines translators would be an enormous boon (благо), especially to science and technology. A machine translator would obviously be a great aid.

In the 80s a machine was developed that can optically scan the *written characters* and print out the translation. It has a program that translates Chinese into English and English into Chinese. At a press demonstration the programmer asked for a phrase to translate and a reporter said:

"Out of sight, out of mind." The phrase was *dutifully* fed into the computer, which replied, by printing out *a siring of* Chinese *characters.* "There," said the programmer, "that means 'out of sight, out of mind'."

The reporter was skeptical. "I don't know Chinese and I don't know that that means 'out of sight, out of mind'."

"Well," replied the engineer, "it's really' quite simple. We'll ask the other program to translate the Chinese into English."

And so once again a string of characters, this time Chinese, was fed into the computer. The translation was typed out almost immediately and it read: *"invisible idiot".*

6.4 Exercises

6.4.1 Try to guess the meaning of the words given in italics in the text

6.4.2 Translate the sentences marked with an asterisk

6.4.3 Enjoy one more example of computers' abilities to speak

In order to make communication between man and machine as *painless* and easy as possible, the computer is being thought not only to speak but also to listen. The Auto-notices Corporation has built a system completed with audio analyses and all of the complex electronics needed to give a computer "cars" that will actually hear (he words spoken into its microphone. The vocabulary is still limited. During a demonstration, the engineer spoke slowly and distinctly *a handful* of the computer's words, and the latter dutifully typed them back. But on one word it failed. While counting "one, two, three," the computer typed back, "one, two, four." *Whereupon* the demonstrator snapped "idiot," and the computer, in a veritable machine version of British aplomb, calmly replied, "Not in vocabulary."

6.4.4 Try to guess the meaning of the words given in italics in the text

6.5 Home exercise *(*to be done in writing)

Translate into Russian

The Importance of How We Calculate

1. In some branches of science, progress depends mainly on finding new ways to calculate, that is to determine the consequences of what we already know in principle. This is presently the situation in the field of plasma physics, which is used both to study the conditions inside of stars and to attain controlled nuclear fusion on the earth.

2. Plasma is a state of matter in which some of the electrons are permanently separated from atoms, and both the electrons and the charged atoms roam around freely. The behavior of plasma is governed by well-known equation that has been studied in various contexts for many years. However, in the specific context of plasmas especially when magnetic forces are also present, it is often difficult to extract from these equations accurate predictions about how the plasma will behave.

3. Physicists believe that this is a problem in mathematical computation rather than some flaw in the equations themselves. However, this distinction is small comfort to those trying to predict the right conditions needed for useful nuclear fusion to occur.

Supplementary material

7 UNIT VII

The Comparative Analysis of the History of the Computer Science and Computer Engineering in the USA and Russia

USA

Howard H. Aiken And The Computer

Howard Aiken's contributions to the development of the computer - notably the Harvard Mark I (IBM ASSC) machine, and its successor the Mark II - are often excluded from the mainstream history of computers on two technicalities. The first is that Mark I and Mark II were electro-mechanical rather than electronic; the second one is that Aiken was never convinced that computer programs should be treated as data in what has come to be known as the von Neumann concept, or the stored program.

It is not proposed to discuss here the origins and significance of the stored program. Nor I wish to deal with the related problem of whether the machines before the stored program were or were not "computers". This subject is complicated by the confusion in actual names given to machines. For example, the ENIAC, which did not incorporate a stored program, was officially named a computer: Electronic Numeral Integrator And Computer. But the first stored-program machine to be put into regular operation was Maurice Wiles' EDSAC: Electronic Delay Storage Automatic Calculator. It seems to be rather senseless to deny many truly significant innovations (by H.Aiken and by Eckert and Mauchly), which played an important role in the history of computers, on the arbitrary ground that they did not incorporate the stored-program concept. Additionally, in the case of Aiken, it is significant that there is a current computer technology that does not incorporate the stored programs and that is designated as (at least by TEXAS INSTRUMENTS®) as "Harvard architecture", though, it should more properly be called "Aiken architecture". In this technology the program is fix and not subject to any alteration save by intent -as in some computers used for telephone switching and in ROM.

Aiken was a visionary, a man ahead of his times. Grace Hopper and others remember his prediction in the late 1940s, even before the vacuum tube had been wholly replaced by the transistor, that the time would come when a machine even more powerful than the giant machines of those days could be fitted into a space as small as a shoe box.

Some weeks before his death Aiken had made another prediction. He pointed out that hardware considerations alone did not give a true picture of computer costs. As hardware has become cheaper, software has been apt to get more expensive. And then he gave us his final prediction: "The time will come", he said, "when

manufacturers will gave away hardware in order to sell software". Time alone will tell whether or not this was his final look ahead into the future.

In the early 1960s, when computers were hulking mainframes that took up entire rooms engineers were already toying with the then - extravagant notion of building a computer intended for the sole use of one person. By the early 1970s researches at Xerox's Polo Alto Research Center (Xerox PARC) had realized that the pace of improvement in the technology of semiconductors - the chips of silicon that are the budding blocks of present-day electronics - meant that sooner or later the PC would be extravagant no longer They foresaw that computing power would someday be so cheap that engineers would be able to afford to devote a great deal of it simply to making non-technical people more comfortable with these new information - handling tools in their labs, they developed or refined much of what constitutes PCs today, from "mouse pointing devices to software "windows"

Although the work at Xerox PARC was crucial it was not the spark that took PCs out of the hands of experts and into the popular imagination That happened inauspiciously in January 1975 when the magazine *Popular Electronics* put a new kit for hobbyists, called the Altair, on its cover for the first time anybody with $400 and a soldering iron could buy and assemble his own computer The Altair inspired Steve Wosniak and Steve Jobs to build the first Apple computer, and a young college dropout named Bill Gates to write software for it Meanwhile the person who deserves the credit for inventing the Altair an engineer named Ed Roberts, left the industry he had spawned to go to medical school Now he is a doctor in small town in central Georgia

To this day researchers at Xerox and elsewhere pooh-pooh the Altair as too primitive to have made use of the technology they felt was needed to bring PCs to the masses In a sense they are right The Altair incorporated one of the first single-chip microprocessor - a semiconductor chip, that contained all the basic circuits needed to do calculations - called the Intel 8080 Although the 8080 was advanced for its time, it was far too slow to support the mouse, windows and elaborate software Xerox had developed Indeed, it wasn't until 1984, when Apple Computer's Macintosh burst onto the scene, that PCs were powerful enough to fulfill the original vision of researchers "The kind of computing that people are trying to do today is just what we made at PARC in the early 1970s" says Alan Kay, a former Xerox researcher who jumped to Apple in the early 1980s.

Researchers today are proceeding in the same spirit that motivated Kay and his Xerox PARC colleagues in the 1970s to make information more accessible to ordinary people But a look into today's research labs reveals very little that resembles what we think of now as a PC For one thing, researchers seem eager to abandon the keyboard and monitor that are the PC's trademarks Instead they are trying to devise PCs with interpretive powers that are more humanlike - PCs that can hear you and see you, can tell when you're in a bad mood and know to ask questions when they don't

understand something

It is impossible to predict the invention that, like the Altaic, crystallize new approaches in a way that computers people's imagination.

Top 20 Computer Systems

From soldering irons to SparcStations, from MITS to Macintosh, personal computers have evolved from do-it-yourself kits for electronic hobbyists into machines that practically leap out of the box and set themselves up. What enabled them to get from there to here? Innovation and determination. Here are top 20 systems that made that apid evolution possible.

• MITS Altair 8800

There once was a time when you could buy a top-of-the-line computer for $395. The only catch was that you had to build it yourself. Although the Altair 8800 wasn't actually the first personal computer (Sceibi Computer Consulting's 8008-based Scelbi-8H kit probably took that honor in 1973), it grabbed attention. MITS sold 2000 of them in 1975 - more than any single computer before it.

Based on Intel's 8-bit 8080 processor, the Altair 8800 kit included 256 bytes of memory (upgradable, of course) and a toggle-switch-and-LED front panel. For amenities such as keyboard, video terminals, and storage devices, you had to go to one of the companies that sprang up to support the Altair with expansion cards. In 1975, MITS offered 4- and 8-KB Altair versions of BASIC, the first product developed by Bill Gates' and Paul Alien's new company, Microsoft.

If the personal computer hobbyists movement was simmering, 1975 saw it come to a boil with the introduction of the Altair 8800.

• Apple II

Those of you who think of the IBM PC as the quintessential business computers may be in for a surprise: The Apple I! (together with VisiCalc) was what really made people to look at personal computers as business tools, not just toys.

The Apple II debuted at the first West Coast Computer Fair in San Francisco in 1977. With built-in keyboard, graphics display, eight readily accessible expansion slots, and BASIC built-into ROM, the Apple II was actually easy to use. Some of its innovations, like built-in high-resolution color graphics and a high-level language with graphics commands, are still extraordinary features in desk top machines,

With a 6502 CPU, 16 KB of RAM, a 16-KB ROM, a cassette interface that never really worked we!! (most Apple It ended up with the floppy drive the was announced in 1978), and color graphics, the Apple II sold for $1298.

• Commondore PET

Also introduced at the first West Coast Computer Fair, Commondore's PET (Personal Electronic Transactor) started a long line of expensive personal computers that brought computers to the masses.

(The VIC-20 that followed was the first computer to sell 1 million units, and the Commondore 64 after that was the first to offer a whopping 64 KB of memory)

The keyboard and small monochrome display both fit in the same one-piece unit. Like the Apple II, the PET ran on MOS Technology's 6502 Its $795 price key to the Pets popularity supplied only 4 KB of RAM but included a built-in cassette tape drive for data storage and 8-KB version of Microsoft BASIC in its 14-KB ROM

• Radio Shack TRS-80

Remember the Trash 80" Sold at local Radio Shack stores in your choice of color (Mercedes Silver) the TRS-80 was the first ready-to-go computer to use Zilog s Z80 processor

The base unit was essentially a thick keyboard with 4 KB of RAM and 4 KB of ROM (which included BASIC) An optional expansion box that connected by ribbon cable allowed for memory expansion A Pink Pearl eraser was standard equipment to keep those ribbon cable connections clean.

Much of the first software for this system was distributed on audiocassettes played in from Radio Shack cassette recorders

• Osborne 1 Portable

By the end of the 1970s garage start-ups were pass Fortunately there were other entrepreneurial possibilities Take Adam Osborne for example He sold Osborne Books to McGraw-Hill and started Osborne Computer Its first product, the 24-pound Osborne 1 Portable, boasted a low price of $1795.

More important Osborne established the practice of bundling software - in spades. The Osborne 1 came with nearly $1500 worth of programs WordStar SuperCalc BASIC and a slew of CP/M utilities.

Business was looking good until Osborne preannounced its next version while sitting on a warehouse full of Osborne 1 S Oops Reorganization under Chapter 11 followed soon thereafter.

Xerox Star

This is the system that launched a thousand innovations in 1981 The work of some of the best people at Xerox PARC (Palo Alto Research Center) went into it Several of these - the mouse and a desktop GUI with icons - showed up two years later in Apple s Lisa and Macintosh computers. The Star wasn't what you would call a commercial success however The main problem seemed to be how much it cost It would be nice to believe that someone shifted a decimal point somewhere The pricing started at $50,000

• IBM PC

Irony of ironies that someone at mainframe-centric IBM recognized the business potential in personal computers The result was in 1981 landmark

announcement of the IBM PC Thanks to an open architecture, IBM s clout and Lotus 1-2-3 (announced one year later) the PC and its progeny made business micros legitimate and transformed the personal computer world The PC used Intel's 16-bit 8088, and for $3000, it came with 64 KB of RAM and a S^-inch floppy drive. The printer adapter and monochrome monitor were extras, as was the color graphics adapter.

• Compaq Portable

Compaq's Portable almost single-handedly created the PC clone market. Although that was about all you could do with it single-handedly - it weighed a ton. Columbia Data Products just preceded Compaq that year with the first true IBM PC clone but didn't survive. It was Compaq's quickly gained reputation for engineering and quality, and its essentially 100 percent IBM compatibility (reverse-engineering, of course), that legitimized the clone market. But was it really designed on a napkin?

• Radio Shack TRS-80 Model 100

Years before PC-compatible subnotebook computers, Radio Shack came out with a book-size portable with a combination of features, battery life, weight, and price that is still unbeatable. (Of course, the Z80-based Model 100 didn't have to run Windows.)

The $800 Model 100 had only an 8-row by 40-column reflective LCD (large at the time) but supplied ROM-based applications (including text editor, communications program, and BASIC interpreter), a built-in modem, I/O ports, nonvolatile RAM, and a great keyboard. Wieghing under 4 pounds, and with a battery life measured in weeks (on four AA batteries), the Model 100 quickly became the first popular laptop, especially among journalists.

With its battery-backed RAM, the Model 100 was always in standby mode, ready to take notes, write a report, or go on-line. NEC's PC 8201 was essentially the same Kyocera-manufectured system.

• Apple Macintosh

Whether you saw it as a seductive invitation to personal computing or a cop-out to wimps who were afraid of a command line, Apple's Macintosh and its GUI generated even more excitement than the IBM PC. Apple's R&D people were inspired by critical ideas from Xerox PARK (and practiced on Apple's Lisa) but added many of their own ideas to create a polished product that changed the way people use computers.

The original Macintosh used Motorola's 16-bit 68000 microprocessor. At $2495, the system offered a built-in-high-resolution monochrome display, the Mac OS, and a single-button mouse. With only 128 KB of RAM, the Mac was underpowered at first. But Apple included some key applications that made the Macintosh immediately useful. (It was MacPaint that finally showed people what a mouse is good for.)

• IBM AT

George Orwell didn't foresee the AT in 1984. Maybe it was because Big Blue, not Big Brother, was playing its cards close to its chest. The IBM AT set new standards for performance and storage capacity. Intel's blazingiy fast 286 CPU running at 6 MHz and 16-bit bus structure gave the AT several times the performance of previous IBM systems. Hard drive capacity doubled from 10 MB to 20 MB (41 MB if you installed two drives - just donut ask how they did the math), and the cost per megabyte dropped dramatically.

New 16-bit expansion slots meant new (and faster) expansion cards but maintained downward compatibility with old 8-bit cards. These hardware changes and new high-density 1.2-MB floppy drives meant a new version of PC-DOS (the dreaded 3.0).

The price for an AT with 512 KB of RAM, a serial/parallel adapter, a high-density floppy drive, and a 20-MB hard drive was well over $5000 - but much less than what the pundits expected.

• Commondore Amiga 1000

The Amiga introduced the world to multimedia. Although it cost only $1200, the 68000-based Amiga 1000 did graphics, sound, and video well enough that many broadcast professionals adopted it for special effects. Its sophisticated multimedia hardware design was complex for a personal computer, as was its multitasking, windowing OS.

• Compaq Deskrpo 386

While IBM was busy developing (would "wasting time on" be a better phrase?) proprietary Micro Channel PS/2 system, clone vendors ALR and Compaq wrestled away control of the x86 architecture and introduced the first 386-based systems, the Access 386 and Deskpro 386. Both systems maintained backward compatibility with the 286-based AT.

Compaq's Deskpro 386 had a further performance innovation in its Flex bus architecture. Compaq split the x86 external bus into two separate buses: a high-speed local bus to support memory chips fast enough for the 16-MHr 386, and a slower I/O bus that supported existing expansion cards.

• Apple Macintosh II

When you first looked at the Macintosh II, you may have said, "But it looks just like a PC. "You would have been right. Apple decided it was wiser to give users a case they could open so they could upgrade it themselves. The monitor in its 68020-powered machine was a separate unit that typically sat on top of the CPU case.

• Next Nextstation

UNIX had never been easy to use , and only now, 10 years later, are we getting back to that level. Unfortunately, Steve Job's cube never developed the software base

it needed for long-term survival. Nonetheless, it survived as an inspiration for future workstations.

Priced at less than $10,000, the elegant Nextstation came with a 25-MHz 68030 CPU, a 68882 FPU, 8 MB of RAM, and the first commercial magneto-optical drive (256-MB capacity). It also had a built-in DSP (digital signal processor). The programming language was object-oriented C, and the OS was a version of UNIX, sugarcoated with a consistent GUI that rivaled Apple's.

• NEC UltraLite

Necks Ultralite is the portable that put *subnotebook* into the lexicon. Like Radio Shack's TRS-80 Model 100, the UltraLite was a 4-pounder ahead of its time. Unlike the Model 100, it was expensive (starting price, $2999), but it could run MS-DOS. (The burden of running Windows wasn't yet thrust upon its shoulders.)

Fans liked the 4.4-pound UltraLite for its trim size and portability, but it really needed one of today's tiny hard drives. It used battery-backed DRAM (1 MB, expandable to 2 MB) for storage, with ROM-based Traveling Software's LapLink to move stored data to a desk top PC.

Foreshadowing PCMCIA, the UltraLite had a socket that accepted credit-card-size ROM cards holding popular applications like WordPerfect or Lotus 1-2-3, or a battery-backed 256-KB RAM card.

•Sun SparcStation 1

It wasn't the first RISC workstation, nor even the first Sun system to use Sun's new SPARC chip. But the SparcStation 1 set a new standard for price/performance, churning out 12.5 MIPS at a starting price of only $8995 - about what you might spend for a fully configured Macintosh. Sun sold lots of systems and made the words *SparcStation* and *workstation* synonymous in many peoples minds.

The SparcStation 1 also introduced S-Bus, Sun's proprietary 32-bit synchronous bus, which ran at the same 20-MHz speed as the CPU.

• IBMRS/6000

Sometimes, when IBM decides to do something, it does it right. (Other times... Well, remember the PC jr.?)The RS/6000 allowed IBM to enter the workstation market. The RS/6000's RISK processor chip set (RIOS) racked up speed records and introduced many to term *suprscalar.* But its price was more than competitive. IBM pushed third-party software support, and as a result, many desktop publishing, CAD, and scientific applications ported to the RS/6000, running under AIX, IBM's UNIX.

A shrunken version of the multichip RS/6000 architecture serves as the basis for the single-chip PowerPC, the non-x86-compatible processor with the best chance of competing with Intel.

•Apple Power Macintosh

Not many companies have made the transition from CISC to RISK this well. The Power Macintosh represents Apple's well-planned and

successful leap to bridge two disparate hardware platforms. Older Macs run Motorola's 680x0 CISK line, which is running out of steam; the Power Macs run existing 680x0-based applications yet provide Power PC performance, a combination that sold over a million systems in a year.

•IBM ThinkPad 701 C

It is not often anymore that a new computer inspires gee-whiz sentiment, but IBM's Butterfly subnotebook does, with its marvelous expanding keyboard. The 701 C's two-part keyboard solves the last major piece in the puzzle of building of usable subnotebook; how to provide comfortable touch – typing.

With a full–size keyboard and a 10,4–inch screen , the 4,5 pound 70ic compares favorably with full–size note books. Battery life is good , too.

The Development of Computers in Russia and the Former USSR

The government and the authorities had paid serious attention to the development of the computer industry right after the Second World War. The leading bodies considered this task to be one of the principal for the national economy.

Up to the beginning of the 1950s there were only small productive capacities which specialized in the producing accounting and account-perforating (punching) machines. The electronic numerical computer engineering was only arising and the productive capacities for it were close to the naught.

The first serious steps in the development of production base were made initially in the late 1950s when the work on creating the first industry samples of the electronic counting machines was finished and there were created M-20, "Ural-1", "Minsk-1", which together with their semi-conductor successors (M-220, "Ural-11-14", "Minsk-22" and "Minsk-32") created in the 1960s were the main ones in the USSR until the computers of the third generation were put into the serial production, that is until the early 1970s.

In the 1960s the science-research and assembling base was enlarged. As the result of this measures, all researches connected with creating and putting into the serial production of semi-conductor electronic computing machines were almost finished. That allowed to stop the production of the first generation machines beginning from the 1964.

Next decades the whole branch of the computer engineering had been created. The important steps were undertaken to widen the productive capacities for the 3^{d} generation machines.

Kiev the Home city of BESM

BESM was conceived by S. A. Lebedev to be a model of a Big Electronic Computing Machine (BESM). At first it was called the Model of the Big Electronic Computing Machine, but, later, in the process of its creation there appeared the evident expediency of transforming it in a small computer.

The Main Fault of the 70S or the Years of "Might-Have-Been Hopes"

The great accumulated experience in creating computers, the profound comparison of our domestic achievements with the new examples of foreign computer technique prompted the scientists that it is possible to create the computing means of new generation meeting the world standards. Of that opinion were many outstanding Ukrainian scientists of that time - Lebedev, Dorodnitsin, Glushkov and others. They proceeded from quite a favorable situation in the country.

The computerization of national economy was considered as one of the most essential tasks. The decision to create the United system of computers - the machines of new generation on integrals.

The USA were the first to create the *families* of computers. In 1963-64 the IBM Company worked out the IBM-360 system. It comprised the models with different capacities for which a wide range of software was created.

A decision concerning the third generation of computers (their structure and architecture) was to be made in the USSR in the late 60s.

But instead of making the decision based on the scientific grounds concerning the future of the United system of computers the Ministry of Electronic Industry issued the administrative order to copy the IBM-360 system. The leaders of the Ministry did not take into consideration the opinion of the leading scientists of the country.

Despite the fact that there were enough grounds for thinking the 70s would bring new big progresses, those years were the step back due to the fault way dictated by the highest authorities from above.

The Comparison of the Computer Development in the USA and Russia.

At the time when the computer science was just uprising this two countries were one of the most noticeably influential. There were a tot of talented scientists and inventors in both of them. But the situation in Ukraine (which at that time was one of 15 Republics of the former USSR) was complicated, on one hand, with the consequences of the Second World War and, on the other hand, at a certain period Cybernetics and Computer Science were not acknowledged. Of cause, later it went to

the past, but nevertheless it played a negative role on the Ukrainian computer development.

It also should be noticed that in America they paid more attention to the development of computers for civil and later personal use. But in Ukraine the attention was mainly focused on the military and industrial needs.

Another interesting aspect of the Russian computer development was the process of the 70s when "sovietizing" of the IBM-360 system became the first step on the way of weakening of positions achieved by the Soviet machinery construction the first two decades of its development. The next step that led to the further lag was the mindless copying by the SU Ministry of Electronic Industry and putting into production the next America elaborations in the field of microprocessor equipment.

The natural final stage was buying in enormous quantities of foreign computers last years and pressing to the deep background our domestic researches, and developments, and the computer-building industry on the whole.

Another interesting aspect of the Ukrainian computer development was the process of the 70s when the "sovietising" of the IBM-360 system became the first step on the way of weakening of positions, achieved by the Soviet machinery construction of the first two decades of its development. The next step that led to the further lag was the mindless copying of the next American elaborations in the field of microprocessor technique by the Ministry of Computer Industry.

Conclusion

Having analyzed the development of computer science in two countries we have found some similar and some distinctive features in the arising of computers.

First of all, we would tike to say that at the first stages the two countries rubbed shoulders with eachother. But then, at a certain stage the USSR was sadly mistaken having copied the IBM-360 out of date technology Estimating the discussion of possible ways of the computer technique development in the former USSR in late 1960s - early 1970s from the today point of view it can be noticed that we have chosen a worse if not the worst one. The only progressive way was to base on our domestic researches and to collaborate with the west-European companies in working out the new generation of machines Thus we would reach the world level of production, and we would have a real base for the further development together with leading European companies.

Unfortunately the last twenty years may be called the years of "unrealized possibilities" Today it is still possible to change the situation, but tomorrow it will be too late.

Will the new times come? Will there be a new renaissance of science, engineering and national economy as it was in the post-war period"? Only one thing remains for us - that is to wait, to hope and to do our best to reach the final goal.

8 UNIT VIII

8.1. List of Terms

1.ALGORITHM	1. алгоритм
2.ALGOL	2. алгол
3.ANALOG COMPUTER	3. аналоговая компьютерная машина
4.ASSEMBLY LANGUAGE	4. язык низкого уровня
5.BASIC	5. БЕЙСИК
6.BINARY LANGUAGE	6. язык, использующий двойную систему исчисления
7.BIT	7. бит
8.BLOCK DIAGRAM	8. блок схема
9.CARD READER	9. узел чтения перфокарт
10.CPU	10. центральный процессор
11.COBOL	11. КОБОЛ
12.COD ING	12. кодирование, составление программы
13.COMPILER	13. компилирующая программа
14.COMPUTER	14. компьютер
15.CONSOLE	15. пульт (управления)
16.DISPLAY UNIT	16. дисплей
17.DATA	17. данные, числа
18.DIGITAL COMPUTER	18. цифровой компьютер
19.DISK DRIVE	19. привод запоминающего устройства на дисках
20.EXECUTION	20. исполнение, выполнение
21.FLOW CHART	21. блок-схема
22.FORTRAN	22. ФОРТРАН
23.GENERAL-PURPOSE COMPUTER	23. универсальный компьютер
24.HARDWARE	24. стандартная схема, арматура
25.HIGH-LEVEL LANGUAGE	25. язык высокого уровня
26.INFORMATION	26. информация, данные
27.INPUT	27. ввод
28.INSTRUCTION	28. команда
29.INTERNAL MEMORY	29. внутреннее запоминающее устройство оперативное запоминающее устройство
30.KEYBOARD	30. клавиатура
31.LINKAGE EDITOR	31. согласующая программа редактирования
32.LOW-LEVEL LANGUAGE	32. язык низкого уровня
33.MAINFRAME (COMPUTER)	33. большая вычислительная машина
34.MEMORY CAPACITY	34. емкость памяти
35.MICROPROCESSOR	35. микропроцессор
36.MINI COMPUTER	36. мини-ЭВМ
3.7. OBJECT PROGRAM	37. программа на выходном языке
38.OUTPUT	38. выходной сигнал

39.PACKAGE	39. схемный элемент
40.PL/I	40. ПЛ/1
41.PRINTED CIRCUIT BOARDS	41. печатная плата
42.PRINTOUT	42. вывод на печатающее устройство
43.PROCESS ING	43. обработка данных
44.PROCESSOR	44. процессор
45.PROGRAM	45. программа
46.PUNCHED CARD	46. перфокарта
47.REAL-TIME PROCESSING	47. симультанная обработка данных
48.SECONDARY-MEMORY DEVICE	48. внешнее запоминающее устройство
49.SOFTWARE	49. математическое обеспечение, набор стандартных программ
50.SOURCE PROGRAM	50. исходная программа
51.STORAGE DEVICE	51. накопительное устройство
52.TAPE	52. магнитная лента
53.TERMINAL	53. терминал
54.TEMPLATE	54. шаблон, модель
55.WORD LENGTH	55. длина слова

8.2. Словарь-справочник терминов из области компьютерной техники

1	Адаптер внешнего интерфейса (PLA- Peripheral Interface Adapter)	1 Устройство сопряжения компьютера с внешними устройствами.
2	Адрес (Address)	2 Специальный регистр процессора, который при выполнении логических и арифметических операций является местом запоминания результата операции.
3	Аккумулятор (accumulator)	3 Специальный регистр процессора, который при выполнении логических и арифметических операций является местом запоминания результата операции.
4	АЛГОЛ (ALGOL-Algorithmic language	4 Алгоритмический язык. Он становится языком программирования высокого уровня. Разработан группой ученых разных стран в 1958-1960 гг..
5	Алгоритм (Algorithm)	5 Определенным образом упорядоченный набор действий для решения задачи с конечным числом операций.
6	Аппаратные средства (Hardware)	6 Совокупность электронных и

		механических средств, обеспечивающих физическое функционирование ЭВМ
7	АЛУ (ALU -Arithmetic and Logic Unit)	7 Арифметико-логическое устройство — одно из основных: устройств ЭВМ, выполняющее собственно вычисления.
8	Архитектура (Architecture)	8 Термин, обозначающий структуру связей между элементами ЭВМ, влияющую на основные характеристики компьютера
9	Ассемблер (Assembler)	9 Служебная программа, заложенная в компьютер, преобразующая исходную программу и определяющая, в частности, ее синтаксические ошибки.
10	Байт (Byte)	10 Наименьшая адресуемая единица информации - восемь двоичных разрядов.
11	Бейсик (BASIC - Beginner All-purpose Symbolic Instruction Code)	11 Язык программирования высокого уровня. Предложен как язык для решения задач в режиме диалога человека с машиной.
12	Библиотека (Library)	12 Набор стандартных программ.
13	Бит (Bit-Binary digit)	13 Двоичная цифра 1 или 0, минимальная единица информации.
14	Блок схема (Flow chart)	14 Графическое представление программы для решения на ЭВМ
15	Время доступа (Access time)	15 Время, необходимое на передачу из памяти в процессор одного байта информации.
16	Вспомогательное запоминающее устройство (Backing store)	16 Элемент внешней памяти большого объема
17	Двоичная система счисления (Binary)	17 Система счисления, имеющая основание 2. В ней используются только две цифры - 1 и 0
18	Динамическая память (Dynamic memory)	18 Оперативная память, требующая регенерации
19	Дисплей (VDU -Visual Display Unit)	19 Устройство отображения информации на экране ЭЛТ (электронно-лучевой трубке) -экране телевизора
20	Дуплексный канал (Duplex)	20 Канал для одновременной передачи информации в двух направлениях
21	Естественный язык (Natural Language)	21 Язык общения людей, например, русский язык
22	Интегральная схема (Integral circuitic)	22 Законченная функциональная электрическая схема сложного устройства, выполненная, как правило, на одном кристалле небольшого размера.
23	Интерфейс (Interface)	23 Устройства, управляющие передачей информации между процессором и внешними устройствами.
24	Исходная программа (Source program)	24 Программа, написанная для ЭВМ на символическом языке

			программирования
25	Кило (kilo)	25	В отличии от общепринятого обозначения тысячи в ЭВМ обозначают 2^10 = 1024. Например, 1килобайт (1 Кбайт)
26	Клавиатура (Qwerty)	26	Пульт для ввода информации в ЭВМ. Английское название произошло от первых букв верхнего ряда клавиатуры
27	Кобол (COBOL – Common Business Oriented Language)	27	Язык программирования высокого уровня
28	Код (Cod)	28	Набор правил. Применяется также в качестве заменителя слова “язык”
29	Код операции (OP-code)	29	Комбинация двоичных цифр, определяющая выполнение какой – либо операции ЭВМ.
30	Команда (Instruction)	30	Сочетание кода операции адресов, в соответствие с которым ЭВМ выполняет определённую операцию.
31	Курсор (Cursor)	31	Знак на экране дисплея, указывающий место высвечиваемого очередного вводимого знака.
32	Логический элемент (gate)	32	Основной элемент большинства устройств ЭВМ, выполняющий какую – либо логическую операцию
33	Машинный язык (Machine Language)	33	Язык, непосредственно используемый ЭВМ и не требующий трансляции
34	Мега (Mega)	34	В ЭВМ обозначает 2 – 1048576. Используется для обозначения емкости запоминающего устройства (например, мегабайт)
35	Метка (label)	35	Знак (цифра) идентифицирующая оператор программы
36	Микропроцессор (Microprocessor)	36	Центральный процессор, выполненный на одной интегральной схем
37	Микро - ЭМВ (Microcomputer)	37	ЭВМ, включающая микропроцессор и устройства памяти.
38	Мини – ЭВМ (Mini – computer)	38	Небольшая ЭВМ, несколько больше, чем Микро – ЭВМ
39	Модифицировать программу(Patch)	39	Изменять программу, буквально - “латать”.
40	Набор команд (Instruction set)	40	Состав команд конкретной ЭВМ
41	Неисправность (Bug)	41	Сбой в работе ЭВМ.
42	ОЗУ, оперативно запоминающее устройство (RAM, Random Access Memory)	42	Устройство памяти, позволяющее с большей скоростью осуществить как запись, так и считывание информации.
43	Оператор (Statement)	43	Обобщенная команда на языке высокого уровня.
44	Отладка (Debugging)	44	Отладка программы с целью устранения ошибок.
45	Память постоянная (ROM – Read Only Memory)	45	Память, используемая только для считывания информации.
46	ПЗУ (ROM)	46	Память постоянная, используемая только для считывания информации.

			Обычно используется как энергонезависимая память в ЭВМ
47	Перепрограммируемое ПЗУ (EPROM - Erasable Programmable Read Only Memory)	47	ПЗУ с возможностью перепрограммирования обычно в процессе переналадки ЭВМ.
48	Разгрузка памяти (Damp)	48	Передача информации из основной памяти во вспомогательную (например, в память на магнитной ленте).
49	Распечатка (Hard copy)	49	Отображение результатов работы ЭВМ, как правило, на бумаге
50	Статистическая память (Statistic memory)	50	ЗУ, не нуждающееся в непрерывной регенерации
51	Стек (Stack)	51	Небольшая область оперативной памяти ЭВМ для кратковременного хранения содержимого регистров или переменных.
52	Терминал (Terminal)	52	Устройство визуального Ввода или Вывода информации. Например, дисплей.
53	Триггер (Flip - flop)	53	Логический элемент, на выходе которого может сохраняться либо единица, либо ноль. Применяется для запоминания двоичных чисел.
54	Файл (File)	54	Набор семантических связанных между собой данных, воспринимаемых как единое целое.
55	Флоппи – диск (Floppy dick)	55	Диск из гибкого пластического материала с нанесенным магнитным покрытием. Используется в устройствах внешней памяти.
56	Фортран (Fortran – Formula Translation)	56	Один из языков программирования высокого уровня.
57	Центральный процессор (Central Processing Unit – CPU)	57	Основа ЭВМ, устройство, выполняющее арифметические или логические операции, а также функции управления.
58	Шина (Bus)	58	Совокупность линий передачи информации из одной части ЭВМ в другую (например, шина адресов).
59	Язык высокого уровня (High Level Language)	59	Язык программирования приближенный к естественному языку и удобный для написания программ.
60	Язык (Language)	60	Совокупность команд, которая понимается как программистом, так и ЭВМ.

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