

Министерство науки и образования Украины
Севастопольский национальный технический университет



МЕТОДИЧЕСКИЕ УКАЗАНИЯ

по английскому языку по работе с оригинальными
научно-техническими текстами
для студентов II курса специальностей
8.091401 "Системы управления и автоматики"
8.091501 "Компьютерные системы и сети"
8.080401 "Информационные управляющие системы
и технологии"
дневной формы обучения

Севастополь
2005

УДК.629.123 + 656.61.052

Методические указания по английскому языку для студентов II курса дневного отделения специальностей факультета АВТ по работе с оригинальными научно-техническими текстами / Сост. И.А. Матросова. – Севастополь: Изд-во СевНТУ, 2005 - 60 с.

Методические указания предназначены для формирования у студентов умения и навыков чтения литературы по специальности на английском языке и ведения беседы, связанной с использованием компьютеров., а также обеспечивает усвоение слоя общенаучной лексики и повторение предусмотренного программой грамматического материала.

Последний раздел пособия включает статьи для внеаудиторного чтения и пересказа.

Методические указания утверждены на заседании кафедры практики романских и германских языков (протокол № 5 от 28.01.2005 г.).

Допущено учебно-методическим центром СевНТУ в качестве методических указаний.

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СОДЕРЖАНИЕ

Введение	4
1. УРОК 1	5
2. УРОК 2	12
3. УРОК 3	21
4. УРОК 4	29
5. УРОК 5	37
6. УРОК 6	47
Тексты для чтения и пересказа	54
Библиографический список	60

ВВЕДЕНИЕ

Методические указания рассчитаны на 20-24 часа практических занятий и предназначены для студентов II курса технических вузов специальностей факультета АВТ.

Цель занятий – систематизировать и обобщить весь грамматический материал, предусмотренный программой I курса и подготовить студентов к умению грамотно подходить к пониманию научно-технических текстов по специальности.

Методические указания состоят из шести уроков, каждый из которых включает предтекстовые упражнения, тексты для чтения и пересказа, грамматические упражнения и задания, а также задания, связанные с активацией устной речи.

В целом пособие предназначено для формирования у студентов умения и навыков чтения оригинальной литературы по специальности на английском языке и ведения бесед, связанных с использованием компьютера в практической работе.

1. LESSON 1

Pretext Exercises

1. Translate the derivatives:

to calculate - calculations - calculator;
 to produce - production - producer - reproduction;
 to transform - transformation - transformer;
 extreme - extremely;
 to inform - information;
 special - to specialize - specialist - specialty;
 to use - usage - user - useful - usefully - uselessly - usefulness;
 real - realize - realization - reality;
 to differ - different - differently - difference - indifference.

2. Give antonyms to the following words:

careless, useless, unwritten, indifferent, unable, unreal, destruction, incredible,
 improper, careful, non-reliable, imperfect, powerful, impossible, unsatisfactory.

3. Translate the following words with and without prefixes:

reconstruct, rewrite, redesign, reread, recalculate, rebuild, reproduce,
 prearranged, post-revolutionary, predetermined.

4. Replace the elements given below to make the proper form of a finite verb:

- | | |
|-------------------------|----------------------------|
| 1) be controlled would; | 2) have been looking for; |
| 3) resulted in have; | 4) transforming been have; |
| 5) to is credited; | 6) to assist was; |
| 7) used to began be; | 8) arranged are; |
| 9) be defined can; | 10) needed is; |
| 11) build can be; | 12) put are being inside. |

5. Translate the sentences paying attention to different meanings of "for" and "since".

- 1) He asked for permission to repeat the calculations.
- 2) He started for Kiev by 9.30 train, for he wanted to arrive there early in the morning.
- 3) What are you looking for?
- 4) First adding machines were used £21 calculating taxes.
- 5) For a long time the scientists couldn't find the solution of this problem.
- 6) He couldn't solve this problem for it was too complicated for him.

- 7) The experiment lasted for some weeks.
- 8) For the solution of this complicated problem she was awarded a prize.
- 9) Since then computers began to be used on a larger scale.
- 10) Since 1940 electronics began to develop at an ever increasing speed.
- 11) Since the standard routines of manufacturing this or that component will be put into the computer's memory in advance, the designer will not have to rack his brains (ломать себе голову) for the way to make it.
- 12) Since the very Beginning we were sure that you would fulfill the experiment in time, since you knew how important it was for our work.
- 13) Since nearly all jobs follow a similar pattern, each job has similar records equipment.

6. Read and memorize the following word combinations:

- 1) distant-controlled production processes - дистанционно управляемые производственные процессы;
- 2) the ways of increasing the speed - пути (способы) повышения скорости;
- 3) to perform the calculations - выполнять вычисления;
- 4) at extremely high speed - с очень высокой скоростью;
- 5) to solve a problem - решать проблему;
- 6) special-purpose computers - компьютеры специального назначения;
- 7) general-purpose computer - универсальные компьютеры;
- 8) specific application - специализированное применение;
- 9) to have advantages (over) - иметь преимущества перед;
- 10) reliability of operation - надежность действия;
- 11) by means of - при помощи.

WHAT IS A COMPUTER?

Can you imagine what our world would be like if there were no computers to assist calculations? There would hardly be controlled space-flights, distant-controlled production processes, etc.

For a long time scientists have been looking for ways of increasing the speed of computations. Their attempts have resulted in the development of computing machines which since their invention have been transforming the whole course of scientific achievements.

One of the first attempts is credited to a French mathematician, Pascal by name, who in 1642 designed an elementary adding machine which was to



assist in the calculation of taxes. Yet, it was only 200 years later that computing machines began to be used on a larger scale.

A modern electronic computer is a device in which electronic components, such as transistors, are arranged so as to perform various calculations.

A computer is really a very specific kind of counting machine. It can be defined as an electronic machine which has storage, logic and mathematical capabilities and can perform tasks at extremely fast speed. A computer can do arithmetic problems faster than any person alive. By means of electric circuits it can find the answer to a very complicated problem in a few seconds.

A computer can "remember" information you give it. It stores the information in its "memory" until it is needed. When you are ready to solve a problem, you can get the computer to sort through the stored facts and use only the proper ones. It solves the problem with lightning speed. Then it checks its work to make sure there are no mistakes.

There are different kinds of computers. Some do only one job over and over again. These are special-purpose computers. Each specific application requires a specific computer. A special-purpose computer is built for this purpose alone and cannot do anything else.

But there are some computers that can do many different jobs. They are called general-purpose computers. These are the "big brains" that solve the most difficult problems of science. They answer questions about rockets and planes, bridges and ships.

We used to think of a computer as a large machine with many buttons and flashing lights that took up a whole room. But today computers are becoming smaller and smaller and are even being put inside other devices. Though these small devices are called microcomputers or minicomputers, they are still true computers. There are several advantages in making computers as small as possible. Sometimes weight is particularly important. But weight is not the only factor. Very important peculiarities of minicomputers are their reliability and high-speed operation. The 'smaller the computer the faster it can work. Another advantage is that less power is required to run the computer.

It is the use of transistors instead of vacuum tubes that considerably reduced the power consumption of the computer.

1. Find the equivalents:

- | | |
|------------------------------------|-----------------------------------|
| 1) for a long time | 1) выполнять различные вычисления |
| 2) scientific achievements | 2) аналитические способности |
| 3) to perform various calculations | 3) важные особенности |

- | | |
|---------------------------------|------------------------------|
| 4) by means of | 4) решать сложные проблемы |
| 5) an electronic device | 5) высокая надежность |
| 6) analytical capabilities | 6) в течение долгого времени |
| 7) to solve complicated problem | 7) вместо |
| 8) instead of | 8) при помощи |
| 9) important peculiarities | 9) электронное устройство |
| 10) high reliability | 10) научные достижения |

2. Arrange antonyms:

large, special-purpose, question, after consumption, fast, small, false, insignificant, high speed, general-purpose, advantage, slow, require, purpose, before, low-speed, answer, disadvantage, generation, true, important.

3. Translate into Russian paying attention to the underlined words:

A.

- 1) Our laboratory is provided with the best up-to-date machinery.
- 2) The laboratory provided with all necessary measuring instruments can cope with (справиться с) this task.
- 3) You will solve this problem provided you use a reference-book (справочник).
- 4) We have provided our plant with various safety devices.
- 5) Provided the laboratory fulfills the plan ahead of time the workers will get the premium.

B.

- 1) The engineer asked the operator if he had broken any rule of operating the machinery.
- 2) Power consumption would be considerably reduced if you were able to use transistors instead of vacuum tubes.
- 3) If computers were classified according to the purpose they could be divided into general-and special-purpose ones.
- 4) I'd like to know if it is possible to classify computers according to the purpose they are to serve.

4. Translate the following conditional sentences paying attention to the forms of the verbs:

- 1) If you looked at the machines people had been using up to 1946, you would certainly notice at a glance that they were rather rude and imperfect.



- 2) Controlled space flights would be impossible if there were no computers.
- 3) He wouldn't have earned much money unless he had been an experienced worker.
- 4) If you want to understand what has made the development of computers possible, you have to think of a comparatively recent past.
- 5) Were there no computers, many achievements of modern science would be impossible.
- 6) A worker never breaks his machinery provided he is careful enough.
- 7) Provided you want to get the idea of a computer design, you could find a number of books on this subject.
- 8) Were it possible we should complete this task by Monday.
- 9) If we have got permission to work at the computing center we should begin at once.
- 10) If you observe all the rules of operating the machine, you will increase its productivity.

5. Analyze and translate the following sentences:

- 1) The problem the scientists of the 20 century had to solve was to arrange electronic components in computing devices in the most effective way.
- 2) Electronic computers perform calculations with the speed no human brain is capable of.
- 3) All the operations modern computers perform can be divided into two groups.
- 4) The components a computer consists of have different functions.
- 5) Storage is the unit information is kept in.
- 6) A computer can keep all the information you introduce into its memory.
- 7) The problem we have to solve is rather complicated.
- 8) The machine we speak about is a general-purpose computer,
- 9) A special-purpose computer can do nothing but the work it was built for.

6. Translate into Russian paying attention to the different meanings of the verbs "be" and "have":

- 1) He has just described the functions of these computer components.
- 2) At the examination he had to describe the components of a typical electric circuit.
- 3) By the beginning of the next month they will have repeated this set of experiments.
- 4) They will have to repeat the experiment once more.
- 5) The test was to begin at 9 o'clock.
- 6) The work is to be checked up very carefully to make sure there are no mistakes.

- 7) Their attempts have resulted in the development of computing machines.
- 8) He has come to discuss this problem.
- 9) You have to come to discuss this problem.
- 10) It is to be noted that automation is an important factor of industrial production.
- 11) Electronic devices are to become the basis for the solution of a great number of economic problems.

7. Complete the following sentences choosing the necessary words and word combinations from those given below:

- 1) One of the first attempts to design an elementary adding machine ... to a French mathematician, Pascal by name.
- 2) These electronic components are arranged ... to perform various calculations.
- 3) ... electronic circuits computers can perform different arithmetic operations.
- 4) A computer ... information in its memory until it is needed.
- 5) A computer has capabilities to ... its work to make sure there are no mistakes.
- 6) Each specific application ... a specific computer.
- 7) A special-purpose computer is built for one purpose and cannot do anything...
- 8) But today's computers ... smaller and smaller.
(so as; check; by means of; is credited to; are becoming; stores; else; requires)

8. State to what passages the following titles may suit:

- 1) From the history of computers development.
- 2) Computers classification by functions.
- 3) Definition of a computer.
- 4) The advantages of mini- and microcomputers.

9. Speak on the problems formulated in the previous exercise.



10. Dramatize the dialogue:

А: Между прочим, ты не знаешь, когда был создан компьютер?	HELP: by the way
Б: Не знаю точно, но компьютеры начали использоваться в начале 40-х годов.	in early forties
А: Правда? А я считал, что создателем компьютера был французский математик Паскаль. А он жил в 17 веке, не так ли?	
Б: Ты не совсем прав. Идею создания счетной машинки действительно приписывают Паскалю. Но машина, созданная им, не была тем, что мы называем электронным компьютером. Это было просто элементарное счетное устройство.	was not what we call just
А: Может быть, она была элементарной, но все-таки это была вычислительная машина. И она выполняла те же функции, что и современный компьютер, разве нет?	yet
Б: Ошибаешься. У нее не было логических способностей и блока памяти. Практически она могла выполнять только чисто арифметические операции. Что касается скорости вычислений, она была очень низкой, так как эти счетные машины были не электронными, а механическими устройствами	You are mistaken (wrong); in fact; purely as to

2. LESSON 2

Pretext Exercises

1. Read the international words and guess their meaning.

Decade; operation; to generate; complex; to instruct; multiplication; fraction; type; a result; to result in; coded information; alphabetic; functional; method; to base; binary; signal; automatic; navigation; production; to produce; parallel; physical; voltage; mathematical.

2. Translate the derivatives:

to operate - operator - operation;
to generate - generator - generation;
to instruct - instructor - instruction -
to multiply - multiplication - multiplier;
to base - basic - basically;
to produce - production - producer - introduce - reproduce - reproduction;
to organize - organizer - organization.

3. Group synonyms:

to do; calculations; little; complex; to perform; to develop; to help; operation; to design, to assist; part; ; to use; to name; small; complicated; computations; work; fraction; various; to call; to apply.

4. Make adjectives with the help of the following suffixes. Translate both the initial its derivative into Russian:

-full - use; power; meaning;
-less - use; help; motion; weight; form; meaning;
-ic - bas(e); period; alphabet; electron;
-able - valu(e); change; compar(e); measur(e);
-ent - differ; depend;
-ive - effect; act; operat(e); instruct; complicat(e); product;
-i(al) - function: addition; different; digit; form.

5. Read the verbs with passive meaning:

can perform; would be controlled; is needed; have been transforming; is defined; have been developed; can store; will be performed; will require; can be compared; are being solved; includes; is producing; was processed; have produced; are coordinated; has been solved; represents; were calculated.



6. Translate the following sentences taking into consideration different meanings of "as"

As	/	как (в качестве)	as...as – так же (такой же)...	как
		когда (равняется, составляет, насчитывает)		
	\	так как		
		по мере того, как	as soon as – так только	

- 1) Information can be transferred from the arithmetic unit to memory, or vice versa, as many times as necessary.
- 2) Lebedev's team designed a system called "" serving as an interface to operator.
- 3) As a rule before we can handle any data, we must know how we want to classify- them,
- 4) Information can be defined as a set of marks or signs that have meaning.
- 5) As you know logical operations include comparing, selecting, sorting and matching.
- 6) As the same set of characters may have meaning sometimes as a number, sometimes as an instruction, the computer must be told exactly which address contains an instruction and which contains a quantity.
- 7) As science progresses the speed of computer's operation increases.
- 8) As documents are prepared, you have to assign each document a serial number.
- 9) As the serial numbers are assigned in chronological order, the log (запись) serves as a calendar.

7. Memorize the following words and word combinations:

- 1) desk-type adding machine - настольная счетная машинка;
- 2) to operate - действовать, работать, управлять;
- 3) computing equipment - вычислительное (счетное) оборудование;
- 4) to process information (data) - обрабатывать информацию (данные);
- 5) to provide - обеспечивать;
- 6) digital computer - цифровой компьютер;
- 7) analogue computer - аналоговый компьютер;
- 8) to yield results - давать результаты;
- 9) mathematical equation - математическое уравнение;

- 10) to mean - значить, означать, подразумевать;
- 11) meaning - значение;
- 12) means - средство;
- 13) by means of - посредством, при помощи;
- 14) both... and - как... так и; и... и.

TODAY'S ASTONISHING COMPUTERS

A little over two decades ago computers were small, not very reliable and comparatively slow in operation. Since then several generations of complex electronic computing equipment have been developed, each was significantly better than the one before it. Almost every day a new use is found for these astonishing devices to help man.

Computer, as we know, is a complex electronic device that can store and process vast quantities of information. Following instructions, computing equipment will perform calculations such as addition, subtraction, multiplication and division, and provide the answers to the most complicated problems in a tiny fraction of time.

There are two main types of computing equipment - digital and analogue. They work differently and yield different results.

The digital computer deals with numbers, or coded alphabetic characters, and performs with them required calculations. In its functional aspects the digital computer can be compared to the adding machine, except that this electronic device solves problems of a much more complex nature than the desk-type adding machine. In the digital computer the method of representing numbers and all other information is based on the use of binary digits (abbreviated as "bits") which are represented by electronic signals.

The digital computer can perform a much broader range of functions than the analogue computer. Its applications include all forms of automatic control in science and industry and first of all in space exploration, in automatic piloting, navigation, etc.

The analogue computer, as its name implies,- produces the analogues or parallels of the process to be described or the problem to be solved. It relates physical changes and variables, such as changes of shaft position, changes of voltage, etc., in the form of mathematical equations. It can be used in industrial automatic process, guided missiles, radar and various other systems where the effects of physical variables must be mathematically coordinated. In fact the analogue computer can control most processes which can be described by equations and functions.



Both the digital and the analogue computers must be "programmed". This means they must be set up in such a way that they can produce a result from the information fed into them, and the information itself must be organized so it can be handled by the machines.

These devices working by electronic impulses perform operations at fantastic speed and with great precision.

Exercises

1. Group the equivalents.

- | | |
|----------------------|------------------------|
| 1) reliable | 1) почти |
| 2) comparatively | 2) получать результаты |
| 3) almost | 3) применение |
| 4) quantity | 4) надежный |
| 5) to yield results | 5) решать проблемы |
| 6) to require | 6) точность |
| 7) to solve problems | 7) представлять |
| 8) to represent | 8) требовать |
| 9) application | 9) сравнительно |
| 10) precision | 10) количество |

2. Give antonyms to the words given below:

good, new, slow, complex, addition, different, many, first, to exclude.

3. Compare the following pairs and translate them into Russian:

A.

- 1) will perform - will be performed;
- 2) has answered - has been answered;
- 3) informed - was informed;
- 4) was designing - was being designed;
- 5) calculated - were calculated;
- 6) is equipping - is being equipped;
- 7) will provide - will be provided;
- 8) represent - are represented.

B.

- 1) They were asked to repeat the calculations. They were told to describe the problem.
- 2) Tomorrow he will be informed about it. He will be given a new problem to solve.
- 3) These instructions should be followed. These instructions should be followed by the operator.
- 4) The results of the tests should be compared. These things cannot be compared.
- 5) New type of computing equipment is being developed in our research institute.
- 6) A digital control system can be thought of as an operator who follows a very complicated set of actions.

4. Translate the following passive constructions paying attention to the verbs followed by prepositions:

- 1) Electronic computers are paid great attention to in this article.
- 2) The speed of information processing should be paid special attention to.
- 3) The results of calculations performed by a computer can be fully relied upon.
- 4) All the achievements of modern science are being made use of in modern production processes.
- 5) Different types and systems of computing technique were being spoken about at the January conference.
- 6) I think all the necessary materials should be immediately sent for.
- 7) What was your experiment followed by?
- 8) This device should be looked upon as an experimental one.
- 9) His works are often referred to by other researchers.
- 10) My decision may be influenced by your advice.

5. Translate into English passive constructions.

- 1) Космические полеты и многие производственные процессы управляются компьютерами.
- 2) Весь ход научных достижений был изменен изобретением компьютеров.
- 3) Одну из первых попыток создания вычислительной машины приписывают Паскалю.
- 4) Различные математические и логические операции могут осуществляться с помощью компьютеров в доли (fraction) секунды.
- 5) Вся информация, которая нужна для работы компьютера, хранится в его памяти.
- 6) Результаты работы нужно проверить, чтобы убедиться, что ошибок нет.



- 7) Компьютеры специального назначения создаются для выполнения только одного вида задач.
 8) Когда можно получить результаты вычислений?
 9) На чем основаны твои выводы (conclusions)?
 10) Для чего можно использовать эти программы?
 11) Большую часть физических процессов можно описать уравнениями и функциями.
 12) Когда будет решена моя задача?
 13) Какая информация была введена в компьютер?
 14) Результаты теоретических расчетов нужно сравнить с экспериментальными данными.

6. Form Participle I from the following verbs and give all possible variants of their translation:

Model: to indicate - indicating	указывающий
	указавший
	указывая

to compare; to develop; to use; to know; to inform; to perform; to calculate; to solve; to add; to base; to include; to produce; to describe; to change; to program; to operate.

7. Read non-finite forms: 1) expressing simultaneousness of action; 2) having passive meaning; 3) denoting preceding action.

informing; having informed; being informed; having been informed; having achieved; achieving; being performed; having been performed; having performed; performing; being constructed; having constructed; constructing; having been used; using; being used; having described; describing; having been described.

8. Translate the following phrases taking into consideration the function of the participle:

A.

- 1) the existing methods;
- 2) the functioning unit;
- 3) the adding machine;
- 4) the computing equipment.

B.

- 1) differently functioning machines;
- 2) often changing conditions;
- 3) ever growing need of computations.

C.

- 1) Rapidly increasing speed of calculations can... .
- 2) New principles of information processing being introduced now are... .
- 3) Making experiments we can compare... .
- 4) Being a good mathematician he could... .
- 5) Having compared the results you can... .
- 6) When solving this problem you should... .
- 7) Working differently they yield different results... .
- 8) Being based on binary digits they... .
- 9) Having solved the problem he... .

9. Compare the following word combinations. Define ing-forms:

The operating unit - the operating speed.

The boiling liquid - the boiling temperature.

The shining star - the shining intensity.

The processing equipment - the processing quality.

10. Read the following sentences and point out the sentences containing: 1) Participle I; 2) Gerund:

- 1) The main function of a computer is processing information.
- 2) Now the computer is processing information on your problem.
- 3) A processor is a unit processing input information.
- 4) An electronic machine for processing information is called a computer.
- 5) Without processing information it is impossible to plan and control production processes.
- 6) In processing information you should use a computer.
- 7) When processing information we use a digital computer.
- 8) This method of representing information is based on binary digits.
- 9) When representing information we use binary digits.
- 10) Using an electronic computer you can considerably accelerate your investigations.
- 11) Using a computer it will permit you to increase the speed of calculations.

11. Translate the sentences. Pay attention to gerund with prepositions.

- 1) Control unit is used for interpreting the machine instructions.
- 2) In training specialists practice is as important as theory.
- 3) On completing the experiment analyze the results.
- 4) In modern computers transistors are used for performing complicated operations.
- 5) By repeating the experiment you can get additional results.



- 6) It would be impossible to solve this problem without using a computer.
 7) In describing most physical processes one can use mathematical equations.

12. Form Participle I from the following verbs; use them in short sentences or word combinations 2 functions:

(1) an attribute; (2) an adverbial modifier.

Model: to work – working	→	работающий, работавший
	→	работая

to increase; to look for; to transform; to process (data); to define; to answer.

13. Translate into Russian; define the –ing forms:

- 1) (When) solving new problems scientists have to do a lot of research.
- 2) In looking for ways of increasing the speed of computations Pascal designed an elementary adding machine.
- 3) The unit receiving "raw data" from external source and conveying them into a form understandable for the computer is named an input.
- 4) Having been published long ago, his work is still very important and interesting for specialists.
- 5) One of the advantages of using small computers is that less power is required to run such computers.
- 6) Before processing any data we should classify them.
- 7) Following instructions computing equipment performs different operations.
- 8) Having completed a reviewed block diagram one may proceed to coding the program.

14. Change direct questions given in the right column into indirect ones. Begin them with one of the phrases:

It's interesting to know...	1. What is a computer?
I wonder...	2. What operations can a digital computer perform?
Look here. I'd like to ask you...	3. Does a computer "understand" human language?
Don't you know...	4. Do digital and analogue computers work differently? '
	5. What is the difference between digital and analogue computers?
	6. Is the word "bit" an abbreviation?
	7. What is the difference between digital and analogue computers?
	8. Does an analogue computer perform as broad range of functions as a digital one?
	9. What are the main fields of analogue computers application?
	10. How can physical processes be described mathematically?

15. Compare digital and analogue computers.

3. LESSON 3

Pretext Exercises

1. Read the following verbs paying attention to different pronunciation of "-ed" endings. Explain the reason of the difference.

Supplied; coded; arrived; translated; machined; followed; simplified; converted; performed; represented; prepared; informed; appeared; manipulated; stored; punched; activated; solved; reversed; calculated; listed.

2. Separate the prefixes and explain their meaning:

impossible; unlimited; disproportional; irregular; underdeveloped; decrease; disadvantages; impossibility; regressive; distract; inefficient; illogical; non-reliable; unsolvable; unreal; indifferent; unthinkable; unnecessary; insignificant.

3. Group the equivalents:

- | | |
|---------------|---|
| 1) such as | 1) так называемый |
| 2) since | 2) вместе (наряду) с |
| 3) so-called | 3) единственный |
| 4) at least | 4) затем |
| 5) then | 5) только |
| 6) than | 6) чем |
| 7) only | 7) такой как |
| 8) the only | 8) по крайней мере |
| 9) along with | 9) так как, поскольку; с; с тех пор (как) |

4. Exercise in word building.

a) State to what part of speech the following word belongs:

especially; conversion; transducer; preparation; capable; ability; available; requirement; conversional; representation; virtually; various

b) Give verbs corresponding to the following nouns:

construction; application; classification; computation; subtraction; division; multiplication; addition; processing; memory; functioning; result; selection; instruction; information; conversion.

c) Translate the following words as verbs and as nouns:

change; design; place; use; result; base; code; process; function; control.

5. Memorize the following words and word combinations:

- 1) constituent parts – составные части;
- 2) to arrive from many sources – поступать из многих источников;

3) to arise from – проистекать из (от);

4) to be activated (by) – приводиться в действие (чем-то);

5) and so forth – и так далее;

6) to display the results of the calculations – вывести на экран результаты вычислений;

7) physical medium – физическая среда (посредник);

8) such as – такой как;

9) intelligible (to) – понятный (для);

10) punched card (tape) – перфокарта (лента);

11) appropriate manipulations – соответствующие манипуляции;

12) intermediate data – промежуточные данные;

13) to accept information – принимать информацию;

14) storage capacity – емкость памяти;

15) permanence – постоянство, прочность;

16) recall time – время выдачи (информации);

COMPUTER COMPONENTS AND THEIR FUNCTIONS

The computers of various machines differ in design and operating principles, but most have the common functions.

The essential constituent parts necessary to perform these functions in a general-purpose computer are follows:

(1) Input unit whereby data (in the form of numbers) and operating instructions can be supplied to the . Input devices change human language into machine language or, in technical words, into the machine coding system. This is very simple in principle, but in practice, especially in business data processing applications where input volume is large and arrives from many sources, the translation from human language into machine language can often be a very important cost factor. The problem to be solved by the operator arises not only from the conversion of human language into machine language, but also from a conversion of the language of one machine to another machine.

So we get data into the machine. Once we have data inside the machine, what do we do with them? Let us assume that we have operated upon these data and are ready to bring them out. And now we need special devices to perform the same functions as the input devices, but in reverse.

(2) Out put devices the function of which is to convert machine language into human language. A typical output device may be an electric typewriter activated by the electric impulses supplied by the machine which causes the type keys to strike the ribbon and paper; the carriage to return, and so forth. Output devices are also used for displaying the results of the calculations.



The input and output devices are called peripherals. In practice, input and output usually represent one physical unit or section which is the transducer through which the system communicates with the external world. In one direction it processes some physical medium, such as paper or magnetic tape, punched cards, etc., which has been prepared in a language intelligible to the machine. In the opposite direction it provides information, which has been prepared by the machine system, in form that is intelligible to the operator.

(3) Storage, or memory, is the nerve center of the machine. It is the section in which the initial data, intermediate results, final results, and the statement of the problem are stored. The latter appears as a list of instructions which makes the system perform the appropriate manipulations of the data it has been given. It also accepts the results that have been computed by the arithmetic section. The properties of the information storage device or memory are central to the good functioning of an electronic computer. The capacity, the performance, the recall time, and the reliability of the information storage device are of vital importance for the solution of problems.

(4) The operations or arithmetic section performs the arithmetic operations the system is capable of, such as, addition, subtraction, multiplication, division, square rooting, etc. To do arithmetic is the main job of the operations unit in a scientific computer. In addition to arithmetic, the operations unit of a data processing machine should be capable of performing sorting operations and of doing a certain number of logical operations such as comparing different quantities, classifying transactions¹, selecting accounts and so forth, is in the arithmetic section that the actual solution of the problem is done.

(5) Control unit or just control is the master-mind of the machine. Control is a section that interprets the instructions, the machine has been given, and causes the other parts to perform the appropriate functions at the appropriate time. The control unit is really the central executive of the machine. It controls the operations of the other units of the computer, but it does so purely on the basis of instructions that have to be supplied to the machine by either its builder or its user.

Exercises

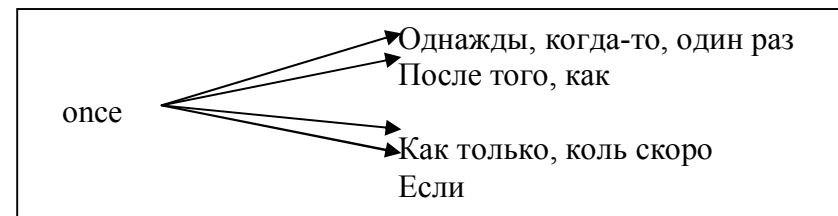
1. Group the equivalents:

- | | |
|-----------------|------------------|
| 1) whereby | 1) либо... либо |
| 2) also | 2) тот же |
| 3) either... or | 3) через, сквозь |
| 4) and so forth | 4) тоже, также |

¹ - дело, сделка

- | | |
|-------------------------|----------------------|
| 5) through | 5) не только... но и |
| 6) not only... but also | 6) посредством чего |
| 7) the same | 7) и так далее |

2. Translate the following sentences taking into account different meanings of "once":



- 1) Once we have data inside the machine, what do we do with them?
- 2) Once the machine has been designed and built once it has been programmed, it's sufficient to push a button and let it proceed.
- 3) A subroutine may be used many times but written only once.
- 4) Once assembled, such networks can represent a substantial body of knowledge.
- 5) Once we discussed this problem. Don't you remember?
- 6) Once you get past the mystique that has been built up around robots you will find that they are not so hard to control.

3. Choose the correct form of a participle from those given in brackets:

- 1) The problem (solving, being solved, having solved) by the operator is connected with the conversion of human language into machine language.
- 2) A typical output device may be an electrical typewriter (activating, having activated, activated) by the electric impulses (supplied, supplying) by machine.
- 3) (Changing, being changed, having been changed) into machine language information can be introduced into the computer.
- 4) Information (being processed, having been processed, processing) by the computer now is very important.
- 5) There are two kinds of numbers (containing, contained) in addresses: permanent or constant numbers and temporary numbers.
- 6) The microcomputers were the first computers (used, having used, using) a single microprocessor chip as the processor.
- 7) A microprocessor is the tiny processor (using, being used, used) in the microcomputers.
- 8) The control program is a large program (occupied, occupying, having occupied) thousands of bytes.



4. Read the sentences in which the underlined words should be translated as: (a) деепричастие, (b) страдательное причастие, (c) действительное причастие.

- 1) Making experiments they used computers for data processing.
- 2) The students making these experiments should know the theory very well.
- 3) The experiments being made by the students are thoroughly planned.
- 4) Controlled space-flights are impossible without computers.
- 5) A computer can be defined as a machine having storage, logic and mathematical capabilities.
- 6) Working at extremely high speed computers can perform some tasks that would otherwise be impossible.
- 7) Computers make few mistakes never forgetting and requiring retraining.
- 8) High-speed computing machines can solve the problem facing the planning organs by processing technical and economic information in the shortest possible time.
- 9) Made without automation, goods have higher cost.
- 10) Working faster, better and more safely than people computers are free from many limitations and drawbacks of human labour and control.
- 11) The data being obtained are of great interest for our work.

5. Translate the following sentences paying attention to the adverbial modifiers expressed by Participles I and II:

- 1) This material cannot be processed unless specially prepared.
- 2) When proved experimentally, the new concept was universally adopted.
- 3) While repeating the calculations, he hoped to get some additional data.
- 4) If applied to production processes, automation enables workers to operate several machine-tools simultaneously.
- 5) Though conducted with great care, the test didn't give the expected results.
- 6) Unless stopped by some external force, the body will keep moving due to inertia.
- 7) When solving a problem one must take into consideration all the existing methods related to the problem in question.
- 8) When classified by functions, robots fall into four basic categories.
- 9) If broken anywhere an electric circuit stops carrying electric current.

6. Translate the following sentences and explain the functions of "-ed"-forms:

- 1) The data obtained are in good conformity with the previous results.
- 2) The technology applied improved the quality of the goods obtained.
- 3) The amount of work performed in time unit is the measure of power.
- 4) The results achieved helped to solve the problem.

- 5) The heat produced is mechanically equivalent to the work done to produce it.
- 6) Power is the ratio of an amount of work performed divided by the time taken by its performance.
- 7) The results received varied with the material used.
- 8) The substance formed possessed some unexpected properties.
- 9) The type of robot control used can be classified as either point-to-point or continuous path.

7. Substitute the participle constructions by the adverbial clauses and vice versa. See the model:

	Automatic machines <u>operating in poisonous gases or in areas of automatic radiation</u> free the man from danger.
→	Automatic machines that operate in..... free the man from danger.....

- 1) The new science dealing with the problems of control was named cybernetics.
- 2) To cope with these extremely complicated tasks which face the country's planning bodies, these organs should be equipped with modern technical means.
- 3) The goods have higher costs if they are made without automation.
- 4) The control of processes in general is wider extension of the principles used in numerical control of machine tools.
- 5) The term "robot" is used for a class of computer-controlled machines that follow a programmable pattern of behavior.
- 6) This program has advantages that make it popular for teaching languages.
- 7) However, the program developed here is flexible.
- 8) There is a special programming language which is used for teaching children of pre-school and junior-school age.
- 9) Initially control was obtained by a human operator tracing deviations and correcting them either directly or through instruments.

8. Express by one term the notions given below:

- 1) A machine which can solve different arithmetical problems by means of electronics.
- 2) Special coding system used to represent information for the machine.



- 3) One of the units of the computer intended to change information from human language into the form intelligible to the machine.
- 4) The place (or unit) where information is kept in the computer.
- 5) The device used to display the results of the calculations or convert machine language into human language.
- 6) Special card on which information is expressed with the help of sets of holes.
- 7) The time necessary to get information from storage.
- 8) Addition, subtraction, multiplication, division, square rooting.
- 9) Comparing, classifying, selecting, matching.
- 10) The unit performing different operations (arithmetical or logical) with the data introduced into the imputer.
- 11) The master-mind of the computer that causes all the computer units to perform the appropriate functions.

9. Say in English. Use these phrases in sentences.

- 1) Вывести на экран результаты вычислений.
- 2) Давайте допустим, что...
- 3) Нам нужны специальные устройства, которые выполняли бы эту функцию.
- 4) Печатная машинка, приводимая в действие электрическими импульсами.
- 5) Обработать какую-то физическую среду (посредник), такую, как, например, бумажная или магнитная лента.
- 6) Быть представленным в форме, понятной оператору.
- 7) Автоматическая обработка данных.
- 8) Запоминать (хранить в памяти) исходные данные, промежуточные и конечные результаты.
- 9) Выполнять соответствующие манипуляции.
- 10) Быть очень важным для решения подобных проблем.
- 11) Обладать способностью выполнять логические операции.
- 12) Решение проблемы.

10. Describe the essential constituent parts of a computer and their functions.

11. Dramatize the dialogue:

- Ты знаешь составные части компьютера?
- Что ты имеешь в виду?
- Я хочу спросить, из каких основных узлов он состоит?
- Их пять: входное устройство, арифметический блок, память, блок управления и выходное устройство.

- Ясно. А как я могу заставить компьютер решить для меня какую-нибудь задачу?
- Ну, прежде всего, нужно сформулировать (to state) ее и составить программу ее решения на языке, понятном для компьютера.
- А что это за язык?
- Это специальный машинный язык или код. Его нужно знать, если хочешь работать с компьютером. Фактически машинных языков много. Но все они основаны на использовании двоичной (binary) системы.
- А что собой представляет программа и формулировка задачи?
- Это что-то вроде перечня инструкций, который диктует машине, какие операции она должна производить. Но если ты действительно интересуешься этой проблемой, я могу порекомендовать тебе несколько популярных книжек о вычислительных машинах.

4. LESSON 4

Pretext Exercises

1. Read word combinations where the verbs "to be", "to have" are modal verbs.

is supplied; is to supply; are introduced; are introducing; are to be introduced; have been compared; had to be compared; were to be done; were done; have to be classified; had to classify; have been classified; had to be handled; had been handled.

2. Translate the following:

can be supplied; cannot have been supplied; cannot have supplied; must have made; have to be performed; must not be done manually; can't be handled; may have handled; must have handled; would be required; should be classified; could be made routine; had to be considered separately; when needed: could be provided.

3. Translate the following groups of words paying attention to suffixes and prefixes:

- 1) to distribute; distribution; distributor; distributed; distributable;
- 2) value; valuable; evaluation; to evaluate;
- 3) effect; effective; effectively;
- 4) to divide; to subdivide; divider; division; subdivision;
- 5) function; to function; functioning; functional; to malfunction; malfunctioning;
- 6) to vary; variable; variety; variability; variation; variant;
- 7) limit; to limit; limitation; unlimited;
- 8) product; productive; productivity; to produce; producer; to reproduce; reproduction.

4. Translate the following sentences paying attention to different meanings of the underlined words.

- 1) These operations can vary from very simple to extremely complicated ones.
- 2) One way to find out whether your plan is the best one is to test a number of plans.
- 3) One can hardly find a sphere where computers are not required.
- 4) Your new proposal has a number of advantages over the old one.
- 5) One should pay special attention to the number of functions this equipment can perform.

6) A long line of improvements in the manual methods of handling information numbers many ideas and devices, computers standing at the end of this line.

7) The same set of characters may have meaning sometimes as a number, sometimes as an instructions.

8) Unlike charges attract one another.

5. Choose the verbal words combinations that can be predicates:

going on; to insure flexibility; in planning the work; is planning the work; can be supplied; performing the functions; involved; by developing codes; is developing codes; have realized; be processed; have been processed; is sequenced; are given; given; when functioning; was functioning.

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

- 1) to set up the goals - ставить цели;
- 2) to attain the goal - достигать цели;
- 3) to fall into - распадаться на;
- 4) file - файл, картотека, массив (данных);
filing - занесение в картотеку, регистрация, подшивка;
- 5) expenses - расходы, издержки, затраты;
- 6) invoice - счет, счет-фактура;
- 7) sale (sales) - продажа, сбыт;
- 8) account - 1) счет (бухгалтерского учета);
accounting - 1) бухгалтерский учет, предоставление отчетности или анализа деятельности;
- 9) manual handling - ручная обработка;
- 10) in a routine way - обычным путем, по стандарту;
- 11) treasury functions - казначейские функции;
- 12) integrated data processing - комплексная обработка данных;
- 13) to appraise - оценивать; appraisal - оценка;
- 14) profit - прибыль, доход; profitable - прибыльный;
- 15) chief executive - главный администратор (американский вариант английского языка);
- 16) transcription - переписывание, копия.

AUTOMATIC DATA PROCESSING METHODS

This article is about the change in management concept. It is the most important change going on in the business world. The new concept of management consists of three parts. The first is setting up enterprise and



departmental goals and the necessary controls to insure flexibility in planning and in the attaining of these goals. The second is organizing so as to spread the power motive throughout the enterprise organizations. And the third is building the organization that can help the chief executive carry out his job of coordinating the parts and that also can supply him with the tools of planning and control.

It is important for us to realize that we are dealing with what we have always dealt with, namely the problem of handling masses of data in such a way that effective business decisions can be made. Data processing is the inevitable paper work necessary to the production and distribution of goods and services. It is certainly increasing in volume and cost, and it is susceptible to industrial engineering techniques.

The five building blocks - classifying, sorting, calculating, summarizing and recording, - are the basic elements into which all data processing problems subdivide. These are the functions which have to be performed whether they are done manually or by the most advanced type of electronic equipment. Now what do we mean by these building blocks?

Classifying: Before we can handle any data such as invoices, orders, or other source materials, we must know how we want to classify these data. This is quite commonly done by developing codes. **Sorting:** Sorting falls generally into two types. First, sorting to sequence for transcription to other records or for filing purposes. Second, sorting to obtain a distribution, such as by product, by territory, or by types of expense.

Calculating: Multiplication and division problems involved in data processing vary from very simple calculations up to extremely complicated ones.

Summarizing: There are several types of summarizations that are commonly required in data processing. Those that are most familiar are totals of sales invoices, sales orders, production and sales statistics, or total expenses such as would be required for accounting records.

Recording: Recording includes transcription, reproduction, and filling of source documents. Computers stand at the end of a long line of improvements in the manual methods of classifying, sorting, summarizing and recording. Basically, they provide intercommunication without manual interference and integrate all sorting, calculating, summarizing and recording operations. Computers have an unlimited potential for development, but a vast amount of work must be done in development of organization and procedures to the point where they can take full advantage of these new techniques. Accounting and statistical data can be processed on electronic equipment at incredible speed for three reasons:

The first reason is that equipment can handle the building blocks very fast. The second reason that data processing can be handled so speedily is because of automatically sequenced operations. Once the instructions are given to computer, there is no need to stop for manual handling as the machine goes from one step in the process to another. The final element of speed is that all exceptions can be made routine. In the preceding stages of data processing all exceptions to the regular procedure had to be handled as exceptions: that is, they had to be handled outside the flow of regular procedures. But if we can think of all possible exceptions and if we can write instructions to the electronic equipment, the machine will handle the exceptions in a routine way without stopping. For these three reasons data can be processed at incredible speed on electronic computers. Now it is necessary to develop an integrated approach wherein the requirements of sales, production planning, material control, statistical accounting and treasury functions are viewed together so that a consolidated, coordinated system of data processing can be thoroughly developed. The use of such an electronic integrated data processing system will make available three kinds of information:

1. Information with which to plan. This information will consist of appraisals of the future, analysis of past data to provide forecasts and the rapid preparation of detailed schedules for manufacturing, purchasing and so forth.
2. Information with which to test plans. Once a budget plan is set, is it the best plan? One way to find out is to test a number of plans to see which provides the best balance and maximum profit results.
3. Information with which to control plant operations and change plans whenever necessary. This information will consist of daily reports when needed and weekly and monthly reports prepared timely and in sufficient detail so that control can become effective. These three kinds of information add up to the tools of management planning and control.

Exercises

1. Group the equivalents:

- | | |
|----------------------|-----------------------------------|
| 1) enterprise | 1) счета на закупленные материалы |
| 2) to carry out | 2) исключения |
| 3) chief executive | 3) прогноз, предсказания |
| 4) transcription | 4) предприятие |
| 5) purchase invoices | 5) казначейские функции |
| 6) exceptions | 6) обеспечивать |
| 7) to provide | 7) главный администратор |
| 8) forecast | 8) комплексная обработка данных |



- 9) treasury functions 9) копия, переписывание
 10) integrated data 10) выполнять
 processing

2. Translate into Russian and give antonyms:

unnecessary, ineffective, decrease, multiply, before, purchase, simple, at the beginning, long, automatic, without, unlimited, disadvantage, fast, initial to start, irregular, worst.

3. Find the Russian equivalents to the following words combinations:

the change in management concept: changes going on in the business world; to set up the goals and tasks; to insure flexibility in planning; to help the chief executive to carry out his job; to deal with the problem of handling information; effective business decisions; decision making; to increase in volume and cost; to fall into two class.

4. Translate into Russian, define the "-ing" and "-ed" forms:

- 1) During the process the information wanted is automatically "captured" and transcribed on to the paper tape or standard punched cards.
- 2) The operations being analyzed are connected with data processing.
- 3) When considering new equipment the first basic cost to be calculated is the capital investment required.
- 4) A machine in the cybernetic sense being any system of parts, physical or not, operating in relation to one another, we must not think of machines in the restricted form.
- 5) Sorting falls generally into two types.
- 6) Information in some types of computers requiring electrical energy to remain in storage, removal or loss of power destroys or alters the content.
- 7) The kernel (base) software contains all programs intended for correct functioning application programs.
- 8) The machine operates 24 hours per day, part of the time being spent on checking.
- 9) Having been divided into equal portions, the data were fed into the memory of the computer from punch cards or magnetic tapes.
- 10) A number of elementary operations which would substantially slow down the fulfillment of the order instructions if centrally controlled are carried out by local controls.
- 11) The functions performed can be done either manually or by the most advanced type of electronic equipment.
- 12) All operations are carried out by a single universal parallel action arithmetical unit, the latter consisting of two receiving registers and an adder.

5. Say in English:

- 1) Вычислительная машина, используемая для этой цели....
- 2) Производя вычисления с высокой скоростью, компьютер может...
- 3) Решив эту задачу, вы можете перейти к следующей.
- 4) Поскольку компьютер специального назначения предназначен только для задач одного типа, он не годится для вашего эксперимента.
- 5) Обсуждая эту проблему, вы должны принять во внимание....
- 6) Документы, подготовленные для обработки....
- 7) Следуя инструкциям, компьютер выполняет различные математические и логические операции.
- 8) Информация, хранящаяся в памяти компьютера....
- 9) Этот блок, называемый запоминающим устройством или блоком памяти, предназначен для...
- 10) Разработав новый подход к решению задач такого типа, он....

6. Analyze and translate the following sentences paying attention to the absolute participle construction.

A.

- 1) The problem being easy, the students solved it at once.
- 2) Electronic computers working faster, better and more safely than people, the technological advance can be liberated from the limitations of human labour and control.
- 3) He started a new set of experiments, all of them being thoroughly planned.
- 4) Space flights requiring complicated calculations, computing machines are used for this purpose.
- 5) Engineers use computers in different production processes, the latter assisting in making all the necessary calculations at a great speed.
- 6) First computers being rather crude and imperfect, scientists went on perfecting them,
- 7) Scientists having devised fast-acting computing machines, calculations of most complicated problems can be done very quickly.
- 8) Analogue computers can simulate different physical processes, the latter being described by equations and functions.
- 9) The analogue computer is used in industrial automatic processes, its main function being to relate physical changes and variables.

B.

- 1) The test completed, the experimentator put down the results.
- 2) The first computers introduced, their effectiveness for production control was immediately recognized.



- 3) The validity of the new method proved, it was commonly accepted.
- 4) The results obtained, you should interpret them.

C.

- 1) With the First computers introduced in the early forties, people began to use them for production control.
- 2) The operator was demonstrating the work of the computer, with the students watching his actions with great interest.
- 3) With the current on, the machine automatically starts operating.

7. Translate the following noun groups taking into account the correlation of their elements.

new management concept
 every enterprise organization
 necessary planning flexibility
 basic elements description
 specific enterprise organization
 electronic equipment operation
 proposed division problem
 total express statistics
 detailed schedules analysis
 regular procedures flow
 normal input device operation
 necessary daily reports analysis
 limited memory device volume
 integrated data processing system
 sufficient information processing capacity
 detailed production process planning

8. Which phases of the left column correlate with the definitions in the right column?

- | | |
|--|--------------------------------------|
| 1) The person responsible for coordinating the work of different part of departments of an enterprise. | 1) output device |
| 2) The paper work necessary for successful production and distribution of goods. | 2) integrated data processing system |
| 3) Classifying, sorting, calculating, summarizing, recording. | 3) automatic data processing |

- | | |
|--|-------------------------------------|
| 4) Data handling performed without interference. | 4) input (raw) information manual |
| 5) The technique of data handling according to which production planning, material control, requirements of sales, statistical accounts, etc. are viewed together. | 5) data processing |
| 6) One of the computer units intended for converting machine language into human language. | 6) the statement of the problem |
| 7) The list of instructions making the computer perform the necessary manipulations with the information in the proper sequence. | 7) the chief executive |
| 8) The information furnished into data processing every problem. | 8) the basic blocks of the computer |

9. Using the terms given in the right part of the previous exercise as a key ideas make short descriptions of these notions.

10. Ask four questions about every paragraph of the text. Let one of them be general, one special, one interrogative-negative and one disjunctive. See the model:

- Model: 1) Do you want to take part in this work?
 2) What work do you want to take part in?
 3) Don't you want to take part in this work?
 4) I hope you want to take part in this work don't you?



5. LESSON 5

Pretext Exercises

1. Translate the derivatives:

- 1) to type, typist, typewriter, to retype, typing;
- 2) function, to function, functional, to malfunction;
- 3) to act, action, active, activity, actor, activist, to react, reaction, interaction, interactive;
- 4) digit, digital, to digitize, digitizer;
- 5) to connect, connection, interconnection, connector, to disconnect;
- 6) simple, to simplify, simplification, simplicity;
- 7) to move, motion, movement, to remove, removal;
- 8) effect, effective, effectiveness, effectively;
- 9) to use, use (n), user, usage, useful, useless, usefully, uselessly, usefulness, uselessness.

2. Group the antonyms:

- a) after, common, input, into, normal, difference, more, latter, the most, relatively, addition, to disconnect, the same, to begin, rarely, to cause, to misunderstand, difficult, direct, to permit, reliable.
- b) output, extraordinary, sameness, former, before, out of, the last, to end, often, subtraction, to connect, to result from, easy, indirect, prohibit, nonreliable, special, less, different, to understand, absolutely.

3. Choose from the word combinations given below those containing the Finite forms of the verb. Use them in short sentences.

necessary to send special signals...; a device used to enter data...; by typing out words...; has additional devices for...; control the flow of data...; the control key...; to control the sequence of operations...; are touched upon...; are usually used for...; selecting from menus...; can select from menus...; which feed signals to...; to feed signals to...; provides graphic input...; can be provided by...; provided by...; the data required for...; helped in creating...; be redrawn and edited...; can be redrawn...

4. Using the following models change the infinitives:

a) from Active to Passive From..

to transform	→	to be transformed
преобразовывать	→	быть преобразованным

to type — печатать	 быть напечатанным
to interrupt- прерывать	 прерываться (чем-то)
to use - использовать	 использоваться
to accomplish - выполнять	 быть выполненным
to call - называть	 называться
to copy - копировать	 быть скопированным

b) from Indefinite to Perfect Form

to transform	→	to have transformed
--------------	---	---------------------

He must	type - он должен (может) напечатать
(He can)	change - -, -, -, изменить
	enter the data - -, -, -, внести данные
	increase - -, -, -, увеличить
	select - -, -, -, выбрать...

He must...	Он, должно быть (возможно), напечатал
(He can)	- -, -, -, изменит
	- -, -, -, ввел данные...
	- -, -, -, увеличил
	- -, -, -, выбрал...

5. Choose the infinitive in the function of (a) the subject; (b) a part of the predicate; (c) an attribute; (d) an adverbial modifier. Explain your choice.

To help creating drawings you...; The data to be processed are...; The data are to be processed by...; are used to copy drawings...; can be redrawn and edited;

To perform the operations quickly it's...; is their ability to position...; is connected to it to interact with...; are used to select data...; The materials to be copied...; The materials have n be copied...;

To copy the data is ...; can be simulated...;

To modify the actions of a key is possible...; This key should be pressed when...;

To understand this effect consult with...; You have to consult with...

6. Compose sentences using the proposed components for their beginning.

- 1) To introduce data into the computer... (a)...one must...
- 2) To modify the actions of any key... (b)...you should...



- 3) To be processed by the computer... (c)...the information (your proposals)
 4) To clear the screen... this technology... (d) the operator... should be...
 5) To be used in practice...
 6) To cope with this problem...

7. Translate the following attributive noun groups:

normal typewriter keyboard; primary data entry device: special computer control keys; video terminal screen; interactive graphics tasks; so-called graphic input devices: easy-to-interpret graphic form; automated drawing entry devices: cathode-ray tube display; side-to-side movement; front-to-back movement: X coordinate change; rapid cursor movement: this relatively small device displacement: quickly performed sorting operations; operator productivity increase; These devices effectiveness; spoken words natural stream.

8. Translate the following sentences taking into account different meanings of the underlined words.

- 1) Before information can be furnished into the input it must be expressed in numerical form.
- 2) Elementary operations of the computers are so detailed that they force you to give a great deal of thought to small details of your mode of operation you would never have regarded as problems before.
- 3) There were a lot of punched cards before the operator.
- 4) This problem could be solved only after the electronic computers were created.
- 5) After two years of joint work of many scientists, high-speed digital computers were created.
- 6) He entered the laboratory before me.
- 7) The computer keyboard is fashioned after a normal typewriter keyboard.
- 8) Before such problems were considered unsolvable.

9. Group the equivalents (There can be more than one English equivalents for some Russian words).

- | | |
|---------------------------------------|-------------|
| 1) вместо; вместо того, чтобы, взамен | 1) in fact |
| 2) такой как | 2) for |
| 3) фактически | 3) without |
| 4) другие | 4) be fore |
| 5) для; так как; в течение | 5) that |
| 6) с тех пор как; так как; если | 6) the same |
| 7) перед; до; перед тем, как | 7) other |

- | | |
|------------------------------|---------------------------------|
| 8) хотя; несмотря на то, что | 8) as |
| 9) без | 9) any |
| 10) тот же; такой же | 10) instead |
| 11) что; который | 11) every |
| 12) любой; каждый | 12) though |
| 13) либо... либо | 13) since |
| 14) как; в качестве | 14) actually |
| 15) как только | 15) such as |
| 16) когда | 16) either... or |
| 17) если | 17) as soon as |
| 18) в течение | 18) when |
| 19) так как; поскольку | 19) if |
| | 20) in spite of (the fact that) |
| | 21) during |
| | 22) because |
| | 23) other |

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

- 1) a keyboard - клавиатура
- 2) a typewriter - пишущая машинка
- 3) extra keys - дополнительные клавиши
- 4) a data entry device - устройства для ввода данных
- 5) sequence - последовательность
- 6) interactive - интерактивный, взаимодействующий
- 7) a lightpen - световое перо
- 8) joystick - координатный указатель
- 9) trackball - шаровой указатель
- 10) digitizer - цифрователь
- 11) voice-голос
- 12) entry - вход, ввод
- 13) stylus - перо прибора
- 14) photocell - фотоэлемент
- 15) touch screen - сенсорный экран
- 16) to feed - подавать, питать
- 17) software - математическое (программное) обеспечение
- 18) hardware - аппаратура, аппаратное обеспечение



DATA ENTRY DEVICES

One of the most common ways to input data into the computer is through the use of the computer keyboard. The computer keyboard is fashioned after a normal typewriter keyboard. The major difference is that computer keyboard has more keys than typewriter. These extra keys are necessary to send special characters to the computer. The keyboard is a primary data entry device used to enter commands and data by typing out words and numbers. The difference between the typewriters and computer keyboard is that the latter has additional punctuation and special computer control keys. Most noticeable is the addition of the escape key (sometimes called the altmode key), the break key (sometimes called the interrupt key) and the control key. Computer keyboards also have a shift key which functions the same as a shift key on a regular typewriter. The shift key and the control key modify the actions of any other key that is pressed at the same time as either of the first two. Sometimes the escape or altmode key will modify the actions of the next few keys pressed after the escape or the altmode key. For example escape sequences (the pressing of a sequence of keys beginning with the escape key) are often used to clear the screen on a video terminal or to cause words to be highlighted to understand the effect of. Pressing the control or escape keys consult your instruction book.

Many keyboards have features that aid to enter data for interactive graphics tasks, but more often so-called graphics input devices are used instead. Graphic input devices allow operator to enter data in an easy-to-interpret graphic form, primarily to specify lines and points. This task is usually accomplished by controlling the position of a set of cursor cross-hairs on the screen. Some devices are touched onto the screen for more direct interaction. Graphic-input devices are also used to select items from a menu. The major types of graphic-input devices are: lightpens, joysticks, trackballs, digitizers, and voice data entry devices. In addition, automated drawing entry devices can be used to permit input of an entire document without manual intervention. Let us consider some of them.

Lightpens. Lightpens are shaped like a pen with a wire connected to it to interact directly with the CRT (cathode-ray tube) display. These devices can be used to position a cursor as well as to point to and select items from menus displayed on the screen. Lightpens consist of a stylus containing a photocell. The stylus produces an electronic signal when it is placed on the screen and detects light. The signal is sent to the computer, which determines the screen location being illuminated at the time the signal is generated.

Touchscreens. Touchscreens are used to simplify touching the CRT display with one's finger or other pointing device.

Joysticks. Joysticks are potentiometric devices that contain sets of variable resistors which feed signals that indicate device position to the computer. These devices rely on the operator's sense of touch and hand-eye coordination to control the position of cross-hairs on the screen. Joysticks are normally set so that side-to-side movement produces change in the X coordinate and front-to-back movement produces change in the Y coordinate. Many users prefer joysticks because they allow rapid cursor movement for relatively small device displacement, enabling graphic operations to be performed quickly.

Mice. Mice are small handheld devices with attached wire that can be moved around by operator on any flat surface to provide graphic input. An important advantage to using mice is their ability to position rapidly the cursor on the screen.

Voice Data Entry. Voice data entry devices are used primarily to increase operator productivity in selecting menu items. Key to effectiveness of voice data entry devices in CAD/CAM (Computer-Aided Design/Computer-Aided Manufacturing) systems is their ability to allow users to enter accurately data and commands in a natural stream of spoken words, numbers and phrases without the artificial pauses between words and phrases required in using some devices.

Digitizers. Digitizers consist of three basic elements: a pen cursor, a tablet, and a software package. Digitizers can be used in CAD/CAM systems to copy existing drawings and send the data directly to the computer for storage. But more frequently, digitizers are used actually to help creating a drawing, using an interactive software package to enter a new sketch or drawing, which can then be redrawn and the display appears on the CRT screen.

Exercises

1. Group the equivalents:

- | | |
|------------------------------------|---------------------------------|
| 1) the major difference | 1) клавиша перевода регистра |
| 2) data entry device | 2) ярко освещаться |
| 3) a shift key | 3) вызывать, причинять |
| 4) to modify the mode of operation | 4) позволить ввести данные |
| 5) to cause | 5) клавиша перехода |
| 6) to be highlighted | 6) главное различие |
| 7) an escape key | 7) в первую очередь |
| 8) to allow to enter data | 8) выбирать из |
| 9) primarily | 9) изменить режим работы |
| 10) to select from | 10) устройство для ввода данных |



2. Define the function of the infinitive in the following word combinations:

A.

- 1) To serve special uses means...
To serve special uses a computer should be...
- 2) To increase the speed of data processing it's necessary.
To increase the speed of data processing is vital for...
- 3) To interact directly with the CRT lightpens are connected with...
To interact directly with the CRT lightpens is possible with the help...

B.

- 1) To be processed by the computer the data should be...
The data to be processed should be...
- 2) To be handled as the regular procedure; the exceptions can be...
The exceptions to be handled can be represented as...

C.

- 1) The aim was to provide integration of these operations.
- 2) This modification was to provide integration of these operations.
- 3) Such approach is to insure flexibility in planning.

3. Translate into Russian

- 1) To do arithmetic operations in the main job of the operations unit.
- 2) It takes not more than 5 sec. to get information out of the storage of this computer.
- 3) What I have to say today is the result of study and analysis.
- 4) The first step in the design of special-purpose equipment is a detailed study of the system to be mechanized.
- 5) The basic problem was to change information so that it could be "understood" by the computer.
- 6) When the data to be put in are the result of calculations carried out on the machine they are recorded on a magnetic tape, and are put in from this tape.
- 7) To operate the machine you must know the details of its internal construction and the mode of its operation.
- 8) In the years to come the computer technique is to become the basis for automation of industrial management.
- 9) The arrangement of the components in each module is determined by the mathematical functions to be performed.
- 10) To make it possible to see a little more precisely where these gains may come from, let us examine them in greater detail.

- 11) To determine the optimal conditions the basic aspects of the system must be examined.

4. Complete the following sentences...

- 1) Electronic machines do not understand human language. So, when the operator wants to put information into the machine memory it is necessary for... to...
- 2) It's not easy for... to... machine language if you are not a specialist.
- 3) The first thing for... to... is to convert human language into the machine language.
- 4) Since the problem was too complicated for... to..., the scientists sent it to the computing center.
- 5) Nowadays every engineer-economist must be acquainted with the principles and mode of operation of electronic data-processing machines otherwise it would be difficult for... to...

5. Translate the below sentences using the model:

fail + Infinitive = потерпеть неудачу; быть не в состоянии;
не + глагол.

- 1) The results of the experiments failed to prove his suggestions.
- 2) This theory seemed to be misunderstood at first many well known scientists failed to recognize it
- 3) The operator informed that the computer failed to perform this function.
- 4) Management intervention is required, for example, when a purchase order fails to arrive on the date specified.
- 5) If the attached wire were broken, the mouse would fail to move.

6. Is it correct to say.

- 1) ... that extra keys on a computer keyboard are necessary to type information at higher speed?
- 2) ... that the shift key can modify the actions of many other key?
- 3) ... that lightpens and joysticks are input devices?
- 4) ... that lightpens are operated manually?
- 5) ... that a break key is the same as an interrupt key?
- 6) ... that the use of the joystick doesn't change the speed or graphic operations performance?



7. Express by a term the notions given below:

- | | |
|---|--------------------------|
| 1) The device which is to be pressed to change the position of a carriage in the process of typing. | 1) graphic input devices |
| 2) The key used to clear the screen on video terminal. | 2) software |
| 3) Special devices used to enter data in graphic form. | 3) a display |
| 4) The device for the visual representation of data. | 4) a lightpen |
| 5) The device used to position the cursor on the screen. | 5) an escape key |
| 6) Data, commands, instructions, etc. | 6) a shift key |

8. Say in English.

Для + существительное...
(для того), чтобы... + инфинитив

- 1) To repeat the experiment, ты должен получить дополнительные данные
- 2) Чтобы изменить положение каретки, вы должны нажать клавишу перевода регистра.
- 3) Для скорейшего решения этой задачи, лучше использовать специализированный компьютер.
- 4) Чтобы работать намного быстрее, суперкомпьютеры оснащены высокоскоростными схемами, внутренними запоминающими устройствами большого объёма, устройствами для конвейерной обработки данных (pipelining devices)
- 5) Он решил повторить эксперимент, to get some additional data.
- 6) Эта клавиша используется для того, чтобы выбрать из меню команд необходимую команду.
- 7) Универсальные компьютеры разработаны для выполнения большого числа различных задач.
- 8) Оператор посоветовал мне использовать специализированный компьютер, чтобы ускорить решение моей задачи.

9. Check up how much you have memorized from the text. Complete the following sentences choosing the proper component from those given in brackets:

- 1) Interactive graphics is an important component of (a computer, mainframes, CAD/CAM systems).
- 2) Lightpens consist of (a stylus; some potentiometric devices; cursor cross-hairs) containing a photocell.
- 3) Lightpens are shaped like (a finger, a joystick, a pen) with a wire enabling it to interact with the CRT display.
- 4) The CRT screen is used by the operator in much the same manner as (a keyboard, drawing board, blackboard).
- 5) (Data entry devices; memory devices; graphic displays) may be of several types used as graphic inputs in CAD/CAM systems.
- 6) Some extra keys on the computer keyboard are necessary (to increase the speed of operator, to send special characters to the computer; to display the results of computer operation)
- 7) Display is a device for (computer modeling; data processing; computing; visual mapping) of output results for the operator or the user.

10. Make up list of the key words of each paragraph of the text.**11. Using the key words give the principal information of each paragraph.****12. Compare a lightpen and a joystick. Begin with the following words:**

"Both a lightpen and a joystick are data entry devices used in interactive graphics. But the lightpen is shaped like... As for the joystick, it is a potentiometer device..."

13. Name the major types of graphic devices and shortly characterize their functions.

6. LESSON 6

Pretext Exercises

1. Define the meaning of the suffixes in the following words and try to translate them:

repeatedly; simplify, personalized; replaceable; differentiate; definition; specific; specify; printer, reference; the referenced + N; numeric; connection; capable; capability; creative; sorting; sorter, flexibility; substitution.

2. Refresh these words and words combinations;

as a matter of fact; the same; though; as if; instead of; in effect; each; in addition to; instead of; however, otherwise; except that; in its turn; such as; a number of; while; considerably.

3. Translate the prepositional phrases:

by simply typing the name of the file; as if you had typed them; instead of several commands; for the purpose of obtaining; in order to produce; with replaceable parameters; for the above mentioned values; to use for sorting; to define by names instead of by numbers; the content of the temporary file; from one file into another, to worry about information; the capabilities of this file.

4. Translate the following groups of words taking into consideration the functions of the underlined segments:

- 1) ... To type the same sequence (последовательность) of commands to perform some common task...
- 2) ... A special file called a batch (группа, партия) file...
- 3) ...To run the whole sequence of commands by simply typing the name of thy batch file...
- 4) ... Note that you don't need to type this...
- 5) ... Files more flexible and easy to use...
- 6) ... Each time you run this file, you tell...
- 7) ... You tell which file to search to find that string (строка)...
- 8) ... When referenced in a file the name is placed - between these signs...
- 9) ... When using batch files, you may...
- 10) ... To avoid this problem you should...
- 11) ... You won't have to worry about information...
- 12) ... To delete (стирать, вычеркивать) temporary files once you finish using them...
- 13) ...Now hat you have seen that..
- 14) ... By using batch processing commands...

5. Translate the following sentences paying attention to different meanings of "it". See the model.

It	Это	- It is a file
	Он, она, оно	- It is labeled
	Не переводится (в функции формального подлежащего)	- It is not easy to solve this problem
	it is ... that (what) – именно	- It is he who helped me

- 1) It is the memory unit of the computer. It is very important for a computer operation. It is the section where initial data, intermediate results of calculations and final results are stored. In fact, it is here were all the necessary information is kept.
- 2) It is necessary for every student to know the fundamental principles of information processing.
- 3) Automation is more than a technology. It is a philosophy of manufacturing. Its uses in industry are countless.
- 4) It is known that the knowledge of general engineering subjects is the basis for the study of special subjects.
- 5) It is a new subject. We shall study it next year. It is impossible without knowing higher mathematics.
- 6) It may be said that these are the main types of graphic input devices.
- 7) The term "engineering" is used in many specialties, it has many meanings.
- 8) It is the development of computers that revolutionized data processing.
- 9) It was the computer that made automation practically possible.
- 10) It goes without saying that computers are in state of continuous development.

6. Read and memorize the following words and word combination:

- 1) a batch file - групповой файл;
- 2) batch processing - групповая(пакетная) обработка данных;
- 3) extension - расширение, продолжение;
- 4) option - вариант, версия;
- 5) value: 1 - значение, ценность;
2 - стоимость;
- 6) to hold (held) - удерживать, держать, хранить;
- 7) temporary (temporal) - временный;
- 8) lose (lost) - терять;



- 9) content: 1 - содержимое;
2 - содержание, оглавление; выполнять;
- 10) to run (ran, ran) - 1 - ход, прогон, эксплуатация;
run(n) - 2-работа; заменять;
- 11) to substitute - заменять;
- 12) to worry (about) - беспокоиться (о, об);
- 13) to delete - стирать;
to delete a page - освободить страницу;
- 14) eventually - в конце концов;
- 15) string - 1 - строка;
2 - цепочка, последовательность.

BATCH PROCESSING

Why Use Batch Files? You may often find yourself repeatedly typing the same sequence of commands to perform some common task. With MS-DOS you can put this command sequence into a special file called a batch file, and then run the whole sequence of commands by simply typing the name of the batch file. Note that you don't need to type the batch file extension, even though all your batch files must include the bat extension in their filenames.

MS-DOS performs these "batches" of your commands just as if you had typed them from the keyboard. This is called batch processing. By using a batch file, you only have to remember to type one command, instead of several. In effect, you use batch files to create personalized commands.

How to Create Batch Files with Replaceable Parameters. There may be times when you want a program be created to run with different sets of data. These data may be stored in various MS-DOS files. With MS-DOS, you can create a batch (bat) file with replaceable parameters, where a parameter is a command option that you define. These parameters, named %0 - %9, hold the places for the values that you supply when you give the batch command.

Replaceable parameters make batch files more flexible and easy to use. For example, you can create a batch file called sorter.bat that sorts a file contained in a specific sequence of characters or strings. Each time you run the sorter batch file, you tell MS-DOS which string you want, which file to search to find that string, and which temporary file to use for sorting. Sorter would then print the resulting list on the printer.

In addition to the ten numeric replaceable parameters, you can use named parameters in batch files. Named parameters allow you to define your replaceable parameters by the names instead of by number. When referenced in a file the name of a replaceable parameter is placed between two percent signs.

How to Use Temporary Files. When using batch files, you may often want a temporary file to be used to hold your work. You could use the same name each time you wanted a temporary file to be used.

However, if you are using more than one batch file that used the same temporary file, you might lose the contents of this temporary file. To avoid this problem, you should use a replaceable parameter to specify the name of the temporary file. Then each time you run the batch file, you'll be able to substitute a unique file name and you won't have to worry about information from one batch file getting into another.

It's also a good idea to delete temporary files once you finish using them. Otherwise, these files would eventually take up all the space on your disk.

Now that you have seen some of the capabilities of batch files, in this section you'll find out how to add power and flexibility to your batch programs by using batch processing commands.

Exercises

1. Group the Equivalents:

- | | |
|----------------------------|------------------------------|
| 1) to perform the commands | 1) пакетная обработка данных |
| 2) the batch file | 2) заменяемые единицы |
| 3) the file name | 3) ряд (набор) данных |
| 4) batch processing | 4) та же строка |
| 5) instead of | 5) выполнять команды |
| 6) replaceable units | 6) название файла |
| 7) a set of data | 7) более гибкий, чем ... |
| 8) a command option | 8) групповой файл |
| 9) more flexible than | 9) версия команды |
| 10) the same string | 10) вместо |

2. Change according to the model:

Model: The computer systems of the first generation. - The first-generation computer systems.

- 1) The applications of this special file.
- 2) The name of the batch file.
- 3) The advantages of replaceable parameters.
- 4) The specific sequence of characters.
- 5) The content of the batch file.
- 6) The replaceable content of the batch file.
- 7) The unique name of the file.



- 8) The timely deletion of temporary files.
- 9) The flexibility of batch processing.

3. Translate the following sentences. State the functions of infinitives, participles and gerunds:

- 1) Programming a computer involves analyzing the problem to be solved and a program to solve it.
- 2) A decision to use a computer should be followed by selecting the type of computing machine best suited for the given problem.
- 3) To cope with these complicated tasks the planning organs should be equipped with technical means.
- 4) The time required for the computer to solve a problem is measured in seconds.
- 5) Electronic computers ensuring timely and correct information, our planning can be greatly improved.
- 6) When expressed in numerical form information can be furnished into the computer.
- 7) The first stage of operation of arty computer-controlled machine-tool system is that of programming.
- 8) A problem to be solved by a digital computer should be expressed in mathematical form.
- 9) With the help of electronic calculating machines our scientists succeeded in generating the language of an ancient people of Mexico.
- 10) To develop our country's national economy is the main task of the government
- 11) To solve this problem with the help of a computer you should translate it into the machine language.
- 12) The data obtained were subjected to special analysis.

4. Translate the sentences paying attention to the Objective Infinitive Constructions:

- 1) We believe him to be carrying out an interesting experiment.
- 2) Everybody knows Pascal to be the first inventor of the mechanical computer.
- 3) The students were explained the high-speed memory unit to use the large-scale integration (LSI) circuits.
- 4) He expects the problem to be solved in a week period.
- 5) Any computer man knows replaceable parameters to make batch files more flexible and easy to use.
- 6) You may often want a temporary file to be used to hold your work.
- 7) There may be times when you would like a program be created to run with different sets of data.

- 8) One can assume this to be self-evident.
- 9) The present-day situation forces more and more countries to start moving into this field of research.
- 10) An efficient laboratory head always knows how to get his people to do their work properly and timely.

5. Choose the correct form and translate into Russian.

- 1) The delegation is reported (to come; to have come) yesterday.
- 2) He is said (to live; to have lived) in hostel.
- 3) Batch files are known (to be widely used; to use widely) in data processing.
- 4) This procedure is known (to call; to be called) batch processing.
- 5) These problems are reported (to be solved; to have been solved) some years ago.
- 6) The students seem (to have made; to be making) an experiment in the laboratory.
- 7) The students are known (to study, to have been studying) this subject since the first year.

6. Define the constructions "complex Subject" and translate the following sentences:

- 1) Microcomputers are likely to be the first computers to use a single microprocessor chip as a processor.
- 2) The volume and accessibility of data are known to play an important role.
- 3) Electronic computer is sure to be a very complicated device.
- 4) This method does not appear to offer any advantages for it doesn't take into account current situation.
- 5) Under such conditions the output is unlikely to increase.
- 6) Further design improvements cannot be expected to increase this figure appreciably.
- 7) The experiment that is being conducted is thought to be highly promising.
- 8) This field of application seems to be entirely unexplored at present
- 9) There appears to be two methods of avoiding such difficulties.
- 10) If the computer input is limited as compared to its internal data-handling capabilities it is more likely to be used for "scientific" computation.
- 11) Input, output, arithmetic unit, control and storage are known to be the main parts of electronic computers.

7. Complete the following sentences. Choose the suitable words or word combinations from those given below.

- 1) To perform some common task one often has to type repeatedly the same _____.



2) This often repeated command sequence can be put into a special file called a ____.

3) A batch file simplifies your work permitting to run the whole sequence of commands by simply typing the ____.

4) Information handling with the use of such batch files is called ____.

5) In using batch files you may create ____.

6) Special types of batch files are files with ____.

7) By a parameter we mean a ____ that you define.

8) ____ make batch files more flexible and easy to use.

9) To hold your work for some period of time you may use a so-called ____ which is deleted once you finish using them.

8. Answer the following questions:

1) What files do we name "Batch files"?

2) What is their main advantage?

3) What is the essence of batch processing?

4) How is it possible to make batch files more flexible?

5) What do we call temporary files?

6) Why is it useful to delete temporary files once you finish using them?

7) What do we mean by replaceable parameters of a batch file?

8) What is a sorter batch intended for?

9) Where is the name of a replaceable parameter placed when it is referenced in a file?

10) What can temporary files be used for?

7. ТЕКСТЫ ДЛЯ ЧТЕНИЯ И ПЕРЕСКАЗА

INFORMATION STORAGE DEVICES: A KEY TO AUTOMATION

The first information storage device used while computing and calculating is of course the human mind. But it forgets quite easily.

Man probably began to supplement his memory to try to avoid forgetting -by using piles of stones, notches on sticks, and later crude drawings. His success with these methods led to the development of written languages, and methods of reproducing the language. Thus, he provided himself with devices for organized information storage: monuments, scrolls, slates, paper, and ink, books, ledgers, filing systems. The development of civilization rapidly increased the need for computation and record keeping.

MODERN INFORMATION STORAGE

Many significant mathematical, mechanical and electronic inventions have aided in the development of information storage devices. Punched cards were developed in the early 1800's to control automatic weaving machines: in the 1890's they were applied to digital calculations of census figures. After that time, punched cards became, until recently, the standard method of storing information in offices where a large volume of computations must be performed; they allowed machines to replace human beings in the processing data. Cards did this by providing a low-cost, large capacity memory that was intelligible to properly programmed machinery. This was a major advance in information storage and data processing.

ELECTRONIC COMPUTERS

In the 1940's, 50 years after punched cards were applied to office work, the next major advance in information storage took place, the development of electromechanical and electronic computer containing new types of information storage devices. A modern electronic computer can calculate over 1000 times faster than electromechanical punched card equipment.

INITIAL INFORMATION STORAGE DEVICES

The first information storage devices used in computers had to be developed to give the computer information much faster than was possible with punched cards. This problem was solved by a bank or vacuum tubes so that the sequence of their "on" or "off" states would express a binary code for numbers of



words. This allowed information to be put into or taken out of storage at electronic speeds of less than

Since several vacuum tubes, plus associated circuits, were required to store each digit, a large-capacity memory using vacuum tubes was costly, bulky and unreliable. Better high-speed memories were needed.

The next two developments were the mercury acoustic delay line and the cathode ray tube, as information storage devices.

The mercury acoustic delay line was still bulky and inconvenient; its reliability depended on precise temperature control. The storage of information on the face of a cathode ray tube, although giving rapid access introduced still greater problems of reliability.

ELECTROMAGNETIC STORAGE

The next two information storage devices were magnetic drums and magnetic tape. In both devices, information is stored as polarized or oppositely polarized or unmagnetized spots on a magnetic coating. This coating is on the surface of a revolving drum or on or in the surface of magnetic tape.

In the case of the rotating drum (a cylinder), information can be written on to or read off from the drum in a few thousandth of a second. Low cost, high capacity, exceptional reliability and random access times of a few milliseconds, are the outstanding characteristics of magnetic drums. They are widely used today as primary memories for small-sized and medium-sized computers, and as auxiliary memories for large-sized computers.

Magnetic drums have one major shortcoming. It is virtually impossible at the present state of the art to rotate drums fast enough to achieve access time much below one millisecond where as access time of a few microseconds is desirable for large computers. To fill this need, a set of small magnetic cores of ferrites has been developed. Although more costly and somewhat less reliable than drums, cores can give random access times of less than ten microseconds. They have rapidly become the standard primary memories for large capacity magnetic drum memories.

In addition, magnetic disc memories have been developed. Although, discs have received less attention than drums, major improvements in magnetic disc devices can be expected in the near future. For storage of information external to the computer, magnetic tape has been very widely applied. It bridges the gap between conventional records including punched cards, and the electronic computer internal memory. Data are regularly fed into and taken out of a computer by means of magnetic tape.

CRITERIA FOR INFORMATION STORAGE DEVICES

In automation applications, the properties of the information storage device or memory are central to the good functioning of an electronic computer. The capacity, the appearance, the recall time and the reliability of the information storage device are of vital importance to the solution of problems. Thus, the major criteria for an information storage device are:

- 1. Access time** - the time required to transfer information from the memory unit through the associated circuitry to the point of need. This should approach zero.
- 2. Capacity** - the number of bits, digits, alphabetic words that the memory unit can hold at one time. This should be high per unit volume.
- 3. Reliability** - the ability of memory unit to accurately accept, retain and to give up information as required. This should approach 100 per cent. It should operate with only routine maintenance for the life of the computer.
- 4. Cost** - the total installed cost of a complete memory system (the basic memory device, plus associated accessories and circuitry) per bit of information. This should be as low as possible.
- 5. Sensitivity to environmental factors** - the effect of temperature, humidity and dust on the operation of the memory unit. The memory should be insensitive to such factors.
- 6. Permanence** - the ability of the memory unit to retain information. This can be an inherent characteristic as with magnetic tape or drums or it may rely on electrical energy as in an acoustic delay line or flip-flop memory. Inherent permanence is highly desirable.

CLASSES OF INFORMATION STORAGE

Devices for storing information can be classified according to their functions. A convenient breakdown includes five classes:

- 1. Primary computer memory** - This is also referred to as the inner, high-speed or working memory. It is the memory that exchanges information with the computer's arithmetic unit in the actual solution of problems. Information from other memory units must be transferred to the primary memory before the information can be used in computation.
- 2. Auxiliary memory** - This is also known as the intermediate-speed memory. It is often used to store computation programs, often-used constants and other data to supplement the primary memory.
- 3. External memory** - This is also called the permanent, low-speed or file memory. It stores the large volume of data to be operated upon by the computer.
- 4. Buffer** - This is a special type of memory used to store, temporarily, information that is being transferred from one memory device to another. It



compensates for differences in speed or other characteristics between the two memories it "buffers".

5. Delay line - This is a special type of memory used to store information for a fixed period of usually a few seconds or less and then to release it, thus introducing a delay.

PHYSICAL METHODS OF STORING INFORMATION IN DEVICES

Many principles have been applied to information storage: heat, light, mechanical, chemical, acoustical, electrostatic, magnetic and electronic. Based on these principles, many information storage devices have been developed. Some of these are:

Only a few of these methods of storing information are of current importance.

For primary and auxiliary memories,

magnetic cores,

magnetic disc

magnetic tape

magnetic core

flip-flop

diode-capacitor

thermal

phosphor

cathode ray tube

ferroelectric

nuclear resonance

photographic film

mercury acoustic delay line

solid acoustic delay line

magnetic drums and magnetic discs are widely used for external storage of information, magnetic drums, magnetic discs, magnetic tape, punched cards and punched tape are widely used. Magnetic drums, magnetic tape and acoustic delay lines are often used as buffers and delay lines.

MAGNETIC CORE MEMORY

Small magnetic cores are used as the primary memory in all large-sized computers. The magnetic core is the only electromagnetic memory which provides true random access, e. g., any specific bit of information can be obtained directly. The extremely fast access time of less than 10 microseconds makes the magnetic core the best primary memory for the large, very fast computers. Magnetic cores, however, have many disadvantages. The foremost disadvantage is that of cost. Other disadvantages include: sensitivity to temperature changes, poor shock resistance, high ratio of space to capacity and extremely difficult manufacturing problems. In spite of this the advantages of cores in access time alone establish their use in the primary memories of computers today.

MAGNETIC DRUMS

Magnetic drum memories are now used as the primary memories for most small and medium-sized commercial computers. Magnetic drums do not offer true random access, since a particular bit must usually travel one revolution of the drum before it is again accessible to the reading head which thus "reads" all of the bits in its particular track or channel. Since each bit passes under the heads at interval from a few millisecond, to less than a millisecond, drums offer "simulated random access". This partial randomness of the drum, however, is one of its principal advantages, in that magnetic reading head scanning all the bits in a track or channel inherently provided by choice of time for reading a great deal of the switching which must be accomplished by electronic circuitry in the core memory.

Magnetic drums offer considerable flexibility in systems design. A single drum may incorporate general storage, delay lines and buffer memory. In general, the high reliability, high capacity per unit volume, low cost per bit and relatively simple electronic circuitry, have established the magnetic drum as a basic information storage device.

The only real disadvantage of the drum has been access time, due to the limitations on the rotation speed.

MAGNETIC DISCS

Magnetic discs operate like drums, except that discs offer greater recording area per cubic foot than do drums. Single discs have been used in certain airborne computers, and have been small in size, with fixed heads. Magnetic disc memories are likely to provide in the future extremely large information storage as in: inventory systems, subscription systems and the like. Such systems are very large and very active. Fast access time, random access, a high degree of reliability and large capacity for the space, are required. It is possible that magnetic discs will supplant magnetic tape and large magnetic drums in many applications.

MAGNETIC TAPE

Magnetic tape is the external memory for most large electronic computers today. Data carried on punched cards, punched tapes or written documents are nearly always transferred to magnetic tape for computer input. Conversely, computer output is recorded on magnetic tape even though the data are later transferred to some other media. At present, tape has no real competitors in this application. Punched cards and punched paper tape are too slow to keep up with modern large computers. Some claims have been made



that photographic emulsions can provide higher packing densities than magnetic coatings, but the easy recording, erasing and recording on magnetic tape are likely to keep it ahead of photographic film.

In a very real sense, magnetic tapes compete with drum and other intermediate-speed memories, access time is, of course, much greater with tape than with drums, but integration of several tape units, faster tape handling mechanisms and better programming can minimize or eliminate the need for intermediate-speed memories.

The primary advantage of tape over other memory media are very low cost and very high capacity per unit volume.

If the primary disadvantage of high access time is minimized, magnetic tape will find greatly increased markets.

FILE NOW - FIND LATER

Filing is often looked on as a necessary evil. No one wants the job. The paper work is still like the blood of any organization, including the engineering department. It carries instructions for operating and it provides feedback for control. Engineering departments need record systems tailored to the local conditions. Keep your filing system simple and your records will be available when you need them.

Methods of Indexing: All files follow one of two basic methods for indexing information: alphabetical or numerical. Key features of two methods, including advantages and limitations, are discussed here.

Alphabetical: This method uses the letters in topic words for identification and indexing.

The methods for alphabetical indexing are available: dictionary style and encyclopedia style. Personnel or customer-name files follow the dictionary style, that is, in absolute sequence. On the other hand, reference files in engineering departments are best arranged in encyclopedia style, where similar subjects are grouped together.

Advantages of an alphabetical system are: 1. Ability to expand indefinitely.

2. Self-indexing. 3. Ease of classifying material for filing, especially names.

Numerical: Certain kinds of information are difficult to file alphabetically.

Whenever there are many similar out unrelated documents, such as drawings, purchase orders and invoices, the alphabetical system does not provide enough identification for specific items, hi these cases, some form of numerical indexing should be used In the numerical system, each document is assigned a number.

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