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Technical English

For Computer Students

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Table of Contents

Lesson One
History of Computers

Early Start

Computers have been around for quite a few years. Some of your parents were probably around in 1951 when the first computer was bought by a business firm. Computers have changed so rapidly that many people cannot keep up with the changes. One newspaper tried to describe what the auto industry would look like if it had developed at a similar pace to changes in computer technology: “Had the automobile developed at a pace equal to that of the computer during the past twenty years, today a Rolls Royce would cost less than $3.00, get 3 million miles to the gallon, deliver enough power to drive (the ship) the Queen Elizabeth II, and six of them would fit on the head of a pin!” These changes have occurred so rapidly that many people do not know how our modern computer got started.

The First Computing Machines “Computers”

Since ancient times, people have had ways of dealing with data and numbers. Early people tied knots in rope and carved marks on clay tablets to keep track of livestock and trade. Some people consider the 5000-year-old ABACUS - a frame with beads strung on wires - to be the first true computing aid. As the trade and tax system grew in complexity, people saw that faster, more reliable and accurate tools were needed for doing math and keeping records. In the mid-600’s, Blaise Pascal and his father, who was a tax officer himself, were working on taxes for the French government in Paris. The two spent hours figuring and refiguring taxes that each citizen owed. Young Blaise decided in 1642 to build an adding and subtraction machine that could assist in such a tedious and time-consuming process. The

machine Blaise made had a set of eight gears that worked together in much the same way as an odometer keeps track of a car's mileage. His machine encountered many problems. For one thing, it was always breaking down. Second, the machine was slow and extremely costly. And third, people were afraid to use the machine, thinking it might replace their jobs. Pascal later became famous for math and philosophy, but he is still remembered for his role in computer technology. In his honor, there is a computer language named Pascal. The next big step for computers arrived in the 1830s, when Charles Babbage decided to build a machine to help him complete and print mathematical tables. Babbage was a mathematician who taught at Cambridge University in England. He began planning his calculating machine, calling it the Analytical Engine. The idea for this machine was amazingly like the computer we know today. It was to read a program from punched cards, figure and store the answers to different problems, and print the answer on paper. Babbage died before he could complete the machine. However, because of his remarkable ideas and work, Babbage is known as the Father of Computers. The next huge step for computers came when Herman Hollerith entered a contest organized by the U.S. Census Bureau. The contest was to see who could build a machine that would count and record information the fastest. Hollerith, a young man working for the Bureau, built a machine called the Tabulating Machine that read and sorted data from punched cards. The holes punched in the cards matched each person's answers to questions. For example, married, single, and divorced were answers on the cards. The Tabulator read the punched cards as they passed over tiny brushes. Each time a brush found a hole, it completed an electrical circuit. This caused special counting dials to increase the data for that answer.

Thanks to Hollerith's machine, instead of taking seven and a half years to count the census information it only took three years, even with 13 million more people since the last census. Happy with his success, Hollerith formed the Tabulating

Machine Company in 1896. The company was later sold in 1911 and in 1912 his company became the International Business Machines Corporation, better known today as IBM.

The First Electric Powered Computer

What is considered to be the first computer was made in 1944 by Harvard Professor Howard Aiken. The Mark I computer was very much like the design of Charles Babbage's Analytical Engine, having mainly mechanical parts but with some electronic parts. His machine was designed to be programmed to do many computing jobs. This all-purpose machine is what we now know as the PC or personal computer. The Mark I was the first computer financed by IBM and was about 50 feet long and 8 feet tall. It used mechanical switches to open and close its electric circuits. It contained over 500 miles of wire and 750,000 parts.

The First All Electronic Computer

The first all electronic computer was the ENIAC (Electronic Numerical Integrator and Computer). ENIAC was a general purpose digital computer built in 1946 by J. Presper Eckert and John Mauchly. The ENIAC contained over 18,000 vacuum tubes (used instead of the mechanical switches of the Mark I) and was 1000 times faster than the Mark I. In twenty seconds, ENIAC could do a math problem that would have taken 40 hours for one person to finish. The ENIAC was built at the time of World War II and as its first job had to calculate the feasibility of a design for the hydrogen bomb. The ENIAC was 100 feet long and 10 feet tall.

More Modern Computers

A more modern type of computer began with John von Neumann's development of software written in binary code. It was von Neumann who began the practice of

storing data and instructions in binary code and initiated the use of memory to store data, as well as programs. A computer called the EDVAC (Electronic Discrete Variable Computer) was built using binary code in 1950. Before the EDVAC, computers like the ENIAC could do only one task; then they had to be rewired to perform a different task or program. The EDVAC's concept of storing different programs on punched cards instead of rewiring computers led to the computers that we know today. While the modern computer is far better and faster than the EDVAC of its time, computers of today would not have been possible without the knowledge and work of many great inventors and pioneers.

Keywords

• **Punched card** - a card on which data can be recorded in the form of punched holes

• **Binary code** - code using a string of 8 binary digits to represent characters

Exercises

A. Comprehension Questions

1. Why was Pascal honored with a computer language named for him?
2. Who was the first to invent a machine whose operating principle is very similar to present-day computers? Describe these similarities.
3. In which process was Hollerith's machine involved and what was its role?
4. Describe all the technical parameters of the first electric powered computer.
5. What were the differences between the Mark I and the ENIAC?
6. What is the main advantage of using binary code in storing data and instructions?

B. Give a synonym to (you can use a dictionary)

- Firm = ……
- Costly = …….
- Integrate = ……..
- Purpose = ……

C. Give an antonym to (you can use a dictionary)

- Complex # ……
- Faster # …….
- Reliable # ……..
- Tedious # ……..

D. Put the proper words into the sentences

Effort, Obsolete, Track, Arithmetic, Device, Mathematicians, Constructed, Engine, Making

1. The Famous philosophers Leibniz and Pascal both ……. Somewhat primitive calculating …….
2. After a great deal of time and ……, a working model of the difference …….. was …….
3. Although the punched card is now becoming ……., it was of critical importance in the development of the computer.
4. An abacus is a …….. that allows the operator to keep …… of numbers while doing the basic ……. operations.
5. A square-shaped wheel wouldn't be ……. because it wouldn't roll easily.
6. Charles Babbage disliked doing the great amount of ……. that ……. had to perform in course of solving problems.
7. "Automating" means …… machines to do jobs that people do.

Lesson Two
BABBAGE'S DREAM COMES TRUE

The Harvard Mark I. A hundred years passed before a machine like the one Babbage conceived was actually built. This occurred in 1944, when Howard Aiken of Harvard University completed the Harvard Mark I Automatic Sequence Controlled Calculator.

Aiken was not familiar with the Analytical Engine when he designed the Mark I. Later, after people had pointed out Babbage's work to him, he was amazed to learn how many of his ideas Babbage had anticipated.

The Mark I is the closest thing to the Analytical Engine that has ever been built or ever will be. It was controlled by a punched paper tape, which played the same role as Babbage's punched cards. Like the Analytical Engine, it was basically mechanical. However, it was driven by electricity instead of steam. Electricity also served to transmit information from one part of the machine to another, replacing the complex mechanical linkages that Babbage had proposed. Using electricity (which had only been a laboratory curiosity in Babbage's time) made the difference between success and failure.

But, along with several other electromechanical computers built at about the same time, the Mark I was scarcely finished before it was obsolete. The electromechanical machines simply were not fast enough. Their speed was seriously limited by the time required for mechanical parts to move from one position to another. For instance, the Mark I took six seconds for a multiplication and twelve for a division; this was only five or six times faster than what a human with an old desk calculator could do.

ENIAC. What was needed was a machine whose computing, control, and memory elements were completely electrical. Then the speed of operation would be limited not by the speed of mechanical moving parts but by the much greater speed of moving electrons.

In the late 1930s, John V. Atanasoff of Iowa State College demonstrated the elements of an electronic computer. Though his work did not become widely known, it did influence the thinking of John W. Mauchly, one of the designers of ENIAC.

ENIAC - Electronic Numerical Integrator and Computer - was the machine that rendered the electromechanical computers obsolete. ENIAC used vacuum tubes for computing and memory. For control, it used an electrical plug board, like a telephone switchboard. The connections on the plug board specified the sequence of operations ENIAC would carry out.

ENIAC was 500 times as fast as the best electromechanical computer. A problem that took one minute to solve on ENIAC would require eight to ten hours on an electromechanical machine. After ENIAC, all computers would be electronic.

ENIAC was the first of many computers with acronyms for names. The same tradition gave us EDVAC, UNIVAC, JOHNIAC, ILLIAC, and even MANIAC.

EDVAC. The Electronic Discrete Variable Computer - EDVAC - was constructed at about the same time as ENIAC. But EDVAC, influenced by the ideas of the brilliant Hungarian-American mathematician John von Neumann, was by far the more advanced of the two machines. Two innovations that first appeared in EDVAC have been incorporated in almost every computer since.

First, EDVAC used binary notations to represent numbers inside the machine. Binary notation is a system for writing numbers that uses only two digits (0 and 1), instead of the ten digits (09) used in the conventional decimal notation. Binary notation is now recognized as the simplest way of representing numbers in an electronic machine.

Second, EDVAC's program was stored in the machine's memory, just like the data. Previous computers had stored the program externally on punched tapes or plug boards. Since the programs were stored the same way the data were, one program could manipulate another program as if it were data. We will see that such programs (manipulating programs) play a crucial role in modern computer systems.

A stored- program computer - one whose program is stored in memory in the same form as its data - is usually called a von Neumann machine in honor of the originator of the stored -program concept.

From the 1940s to the present, the technology used to build computers has gone through several revolutions. People sometimes speak of different generations of computers, with each generation using a different technology.

The First Generation. First generation computers prevailed in the 1940s and for much of the 1950s. They used vacuum tubes for calculation, control, and sometimes for memory as well. First generation machines used several other ingenious devices for memory. In one, for instance, information was stored as sound waves circulating in a column of mercury. Since all these first generation memories are now obsolete, no further mention will be made of them.

Vacuum tubes are bulky, unreliable, energy consuming, and generate large amounts of heat. As long as computers were tied down to vacuum tube technology, they could only be bulky, cumbersome, and expensive.

The Second Generation. In the late 1950s, the transistor became available to replace the vacuum tube. A transistor, which is only slightly larger than a kernel of corn, generates little heat and enjoys long life.

At about the same time, the magnetic-core memory was introduced. This consisted of a latticework of wires on which were strung tiny, doughnut-shaped beads called cores. Electric currents flowing in the wires stored information by magnetizing the cores. Information could be stored in core memory or retrieved from it in about a millionth of a second.

Core memory dominated the high-speed memory scene for much of the second and third generations. To programmers during this period, core and high speed memory were synonymous.

The Third Generation. The early 1960s saw the introduction of integrated circuits, which incorporated hundreds of transistors on a single silicon chip. The chip itself was small enough to fit on the end of your finger; after being mounted in a protective package, it still would fit in the palm of your hand. With integrated circuits, computers could be made even smaller, less expensive, and more reliable.

Integrated circuits made possible minicomputers, tabletop computers small enough and inexpensive enough to find a place in the classroom and the scientific laboratory.

In the late 1960s, integrated circuits began to be used for high-speed memory, providing some competition for magnetic-core memory. The trend toward

integrated-circuit memory has continued until today, when it has largely replaced magnetic-core memory.

The most recent jump in computer technology came with the introduction of large-scale integrated circuits, often referred to simply as chips. Whereas the older integrated circuits contained hundred of transistors, the new ones contain thousands or tens of thousands.

It is the large-scale integrated circuits that make possible the microprocessors and microcomputers. They also make possible compact, inexpensive, high-speed, high-capacity integrated-circuit memory.

All these recent developments have resulted in a microprocessor revolution, which began in the middle 1970s and for which there is no end in sight.

The Fourth Generation. In addition to the common applications of digital watches, pocket calculators, and personal computers, you can find microprocessors - the general-purpose processor-on-a chip (in virtually every machine in the home or business) microwave ovens, cars, copy machines, TV sets, and so on. Computers today are hundred times smaller than those of the first gene- ration, and single chip is far more powerful than ENIAC.

The Fifth Generation. The term was coined by the Japanese to describe the powerful, intelligent computers they wanted to build by the mid-1990s. Since then it has become an umbrella term, encompassing many research fields in the computer industry. Key areas of ongoing research are artificial intelligence (AI), expert systems, and natural language.

Exercises

A. Answer the following questions.

1. What was the main shortcoming of the Mark I and the other electromechanical computers?

2. What is an acronym? Give examples of acronyms.

3. What was the distinguishing feature of ENIAC?

4. What were the two distinguishing features of EDVAC?

5. What is a von Neumann machine?

6. Describe the technological features characteristic of each computer generation.

7. What type of computer memory was once so widely used that its name became almost synonymous with "high-speed memory"?

8. What technological developments made Minicomputers and Microcomputers possible?

B. Give a synonym to (you can use a dictionary)

- To encompass = …….
- Bulky = …….
- Simply = …….
- Linkage = …….
- To anticipate = …….
- Obsolete = …….

C. Give antonyms to (you can use a dictionary)

- Success#.....
- Externally#.....
- To store#.....

- Energy-consuming#.....

D. Put the proper words into sentences:

Analytical, Digital, Unreliable, Sophisticated, Solve, Core, Processor, Computations, An Integral Circuit

1. The Difference Engine could …….equation and led to another calculating machine, the …….Engine, which embodied the key part of a computer system: an input device, a……. , a control unit, a storage place, and an output device.

2. Ada Lovelace helped to develop instructions for carrying out …….on Babbage machine.

3. J. Atanasoff devised the first…….. computer to work by electronic means.

4. First-generation computer were…….. , the main for of memory being magnetic.

5. In the third generation software became more……

6. What was the name of the first ……. computer to work electronically?

7. W hen electricity passed through the …….., it could e magnetized as either “off” or “on”.

8. …….. is a complete electronic circuit on a small chip of silicon.

Lesson Three
First Personal Computers

Until the late 1970s, the computer was viewed as a massive machine that was useful to big business and big government but not to the general public. Computers were too cumbersome and expensive for private use, and most people were intimidated by them. As technology advanced, this was changed by a distinctive group of engineers and entrepreneurs who rushed to improve the designs of then current technology and to find ways to make the computer attractive to more people. Although these innovators of computer technology were very different from each other, they had a common enthusiasm for technical innovation and the capacity to foresee the potential of computers. This was a very competitive and stressful time, and the only people who succeeded were the ones who were able to combine extraordinary engineering expertise with progressive business skills and an ability to foresee the needs of the future.

Such of this activity was centered in the Silicon Valley in northern California where the first computer-related company had located in 1955. That company attracted thousands of related businesses, and the area became known as the technological capital of the world. Between 1981 and 1986, more than 1000 new technology oriented businesses started there. At the busiest times, five or more new companies started in a single week. The Silicon Valley attracted many risk-takers and gave them an opportunity to thrive in an atmosphere where creativity was expected and rewarded.

Robert Noyce was a risk-taker who was successful both as an engineer and as an entrepreneur. The son of an Iowa minister, he was informal, genuine, and methodical. Even when he was running one of the most successful businesses in

the Silicon Valley, he dressed informally and his office was an open cubicle that looked like everyone else's. A graduate of the Massachusetts Institute of Technology (MIT), he started working for one of the first computer-related businesses in 1955. While working with these pioneers of computer engineering, he learned many things about computers and business management.

As an engineer, he co-invented the integrated circuit, which was the basis for later computer design. This integrated circuit was less than an eighth of an inch square but had the same power as a transistor unit that was over 15 inches square or a vacuum tube unit that was 6.5 feet square. As a businessman, Noyce cofounded Intel, one of the most successful companies in the Silicon Valley and the first company to introduce the microprocessor. The microprocessor chip became the heart of the computer, making it possible for a large computer system that once filled an entire room to be contained on a small chip that could be held in one's hand. The directors of Intel could not have anticipated the effects that the microprocessor would have on the world. It made possible the invention of the personal computer and eventually led to the birth of thousands of new businesses. Noyce's contributions to the development of the integrated circuit and the microprocessor earned him both wealth and fame before his death in 1990. In fact, many people consider his role to be one of the most significant in the Silicon Valley story.

The two men who first introduced the personal computer (PC) to the marketplace had backgrounds unlike Robert Noyce's. They had neither prestigious university education nor experience in big business. Twenty-year-old Steven Jobs and twenty-four-year-old Stephen Wozniak were college dropouts who had collaborated on their first project as computer hobbiests in a local computer club. Built in the garage of Jobs's parents, this first personal computer utilized the

technology of Noyce's integrated circuit. It was type-writer-sized, as powerful as a much larger computer, and inexpensive to build. To Wozniak the new machine was a gadget to share with other members of their computer club. To Jobs, however, it was a product with great marketing potential for homes and small businesses. To raise the $1300 needed to fill their first orders Jobs sold his Volkswagen bus and Wozniak sold his scientific calculator. Wozniak built and delivered the first order of 100 computers in ten days. Lacking funds, he was forced to use the least expensive materials, the fewest chips, and the most creative arrangement of components. Jobs and Wozniak soon had more orders than they could fill with their makeshift production line.

Jobs and brought different abilities their venture: Wozniak was the technological wizard, and Jobs was the entrepreneur. Wozniak designed the first model, and Jobs devised its applications and attracted interest from investors and buyers. Wozniak once admitted that without Jobs he would never have considered selling the computer or known how to do it. "Steve didn't do one circuit, design or piece of code. He's not really been into computers, and to this day he has never gone through a computer manual. But it never crossed my mind to sell computers. It was Steve who said, 'Let's hold them up and sell a few.'"

From the very beginning, Apple Computer had been sensitive to the needs of a general public that is intimidated by high technology. Jobs insisted that the computers be light, trim, and made in muted colors. He also insisted that the language used with the computers be "user-friendly" and that the operation be simple enough for the average person to learn in a few minutes. These features helped convince a skeptical public that the computer was practical for the home and small business. Jobs also introduced the idea of donating Apple Computers to thousands of California schools, thereby indirectly introducing his product into the

homes of millions of students. Their second model, the Apple II, was the state-of-the-art PC in home and small business computers from 1977 to 1982. By 1983 the total company sales were almost $600 million, and it controlled 23 percent of the worldwide market in personal computers.

As the computer industry began to reach into homes and small businesses around the world, the need for many new products for the personal computer began to emerge. Martin Alpert, the founder of Tecmar, Inc., was one of the first people to foresee this need. When IBM released its first personal computer in 1981, Alpert bought the first two models. He took them apart and worked twenty-four hours a day to find out how other products could be attached to them. After two weeks, he emerged with the first computer peripherals for the IBM PC, and he later became one of the most successful creators of personal computer peripherals. For example, he designed memory extenders that enabled the computer to store more information, and insertable boards that allowed people to use different keyboards while sharing the same printer. After 1981, Tecmar produced an average of one new product per week.

Alpert had neither the technical training of Noyce nor the computer clubs of Jobs and Wozniak to encourage his interest in computer engineering. His parents were German refugees who worked in a factory and a bakery to pay for his college education. They insisted that he study medicine even though his interest was in electronics. Throughout medical school he studied electronics passionately but privately. He became a doctor, but practiced only part time while pursuing his preferred interest in electronics. His first electronics products were medical instruments that he built in his living room. His wife recognized the potential of his projects before he did, and enrolled in a graduate program in business management so she could run his electronics business successfully. Their annual sales reached

$1 million, and they had 15 engineers working in their living room before they moved to a larger building in 1981. It wasn't until 1983 that Alpert stopped practicing medicine and gave his full attention to Tecmar. By 1984 Tecmar was valued at $150 million.

Computer technology has opened a variety of opportunities for people who are creative risk-takers. Those who have been successful have been alert technologically, creatively, and financially. They have known when to use the help of other people and when to work alone. Whereas some have been immediately successful, others have gone unrewarded for their creative and financial investments; some failure is inevitable in an environment as competitive as the Silicon Valley. Rarely in history have so many people been so motivated to create. Many of them have been rewarded greatly with fame and fortune, and the world has benefited from this frenzy of innovation.

Exercises

A. True or false?

1. Robert Noyce graduated from a prestigious university and gained engineering expertise before he devised the integrated circuit.
2. Robert Noyce was one of the pioneers of the computer industry.
3. The microprocessor influenced the world in ways that its inventors did not foresee and subsequently led to the invention of the integrated circuit.
4. Stephen Wozniak and Steven Jobs used the state-of-the-art technology developed by Robert Noyce when they devised the first personal computer.
5. When Wozniak designed the first model of the PC, he did not plan to market it to the general population.

6. Jobs did not want the PC to be as intimidating to the general public as previous computers were, so he insisted that it include features that were practical and attractive.
7. The Apple Computer company sold their computers to thousands of American schools at discounted rates, thereby introducing their product into the homes of millions of students.
8. Martin Alpert foresaw that the success of the first IBM personal computer was inevitable, so he bought the first two models and devised ways to change them.
9. Martin Alpert's wife was skeptical about the potential of her husband's technical innovations.
10. Alpert s interest in technology was more passionate than his interest in medicine.

B. Give a synonym for words in parentheses

1. Steven Jobs and Stephen Wozniak (worked together) to (invent) the personal computer, and then produced it in a (temporary) production line in a garage.
2. Steven Jobs wanted to (advertise and sell) the personal computer to people who would use it in their homes, so he knew it could be neither (very large) nor (awkward).
3. Stephen Wozniak applied the (most up-to-date) (applied science) when designing the first personal computer, while Steven Jobs designed its (practical functions).
4. People seemed to be less (frightened) by computers when they were made in (soft) colors and were (easily understood by the average person).
5. Robert Noyce's (specialization) in computers was a result of his experience with the (first people) in the computer field while working at his first job.

6. Martin Alpert's wife was never (doubtful) about (the future possibilities) of Tecmar.
7. Martin Alpert studied the first IBM personal computer (with great love and emotion), and (by that means) he was the first innovator to (come forward) with (supplementary devices) for the computer.
8. Whereas some people (grow) as a result of competition, others are (threatened) by it.

C. Some of the following statements describe an act of an entrepreneur (E), others describe an act of an inventor (I), and others could describe both titles (B). Identify each one.

1. Alexander Graham Bell originated the first telephone.
2. Robert Noyce co-invented the integrated circuit and co-founded Intel.
3. In 1890 John Loud created the first ballpoint pen.
4. Robert Noyce's engineering expertise contributed to the development of the microprocessor.
5. Robert Noyce's financial investments helped build one of the most successful companies in the Silicon Valley.
6. Steven Jobs had the original idea to market the first personal computer.
7. King C. Gillette designed the first disposable razor blade.
8. A Frenchman named Benedictus introduced the idea of making safety glass in 1903 after he discovered a chemical that held broken glass together.
9. Martin Alpert devised many new products for the personal computer.
10. Martin Alpert's wife managed his business and marketed his products.

D. Describe the relationship between each of the following pairs of words (antonyms, synonyms, neither).

- Massive/Small
- Skeptical/Unfriendly
- Cumbersome/Awkward
- Potential/Ability
- Anticipate/Foresee

E. Choose the word to complete each of the following sentences.

1. Whenever the inventor was working on an innovation, she (emerged from/withdrew to) her house because she didn't want to be disturbed.
2. The new computer program was (collaborated / devised) by the newest student in the class.
3. The executives bought a (cumbersome/portable) copy machine because they needed to take it to meetings.
4. The computer enthusiast devised a portable model that had several practical (applications/markets) for educators.
5. It was Wozniak's (expertise/skepticism) that made it possible for him to devise the first personal computer.
6. The government (loaned/donated) $100 million to the corporation, expecting it to be repaid with 12 percent interest.
7. The investors (anticipated/intimidated) the higher profits because of the activity in the stock market.
8. When computers are not working, it is (inevitable/avoidable) that work will be delayed.

F. Cross out the one word that does not have the same meaning as the other three words.

1. Everyone liked the computer salesman because he was (genuine/ calculating/ sincere/ unaffected).
2. The corporation president (benefited/contributed/gave/donated) his services to the school of business.
3. The sudden decrease in sales was not (understood/ foreseen/ anticipated/ predicted) by anyone.
4. The corporate office of the manufacturing company was so close to the factory that the noise in the office was (muted/ vivid/ intense/ extreme).
5. There are many specialized (parts/ components/ contributors/ elements) in the memory bank of a computer.
6. The software company has the (capacity/ extent/ potential/ ability) to employ 500 people.
7. After the young investor earned a million dollars, he was highly regarded for his financial (skillfulness/ wizardry/ good fortune/ aptitude).
8. The software engineer's (expertise/ intelligence/ proficiency/ mastery) was limited to one area.
9. The computer-game business (celebrated/ thrived/ prospered/ progressed) during the summer months.
10. They undertook their (venture/ risky undertaking/ challenge/ decision) after making careful calculations.

G. Complete the paragraph below.

Although Jobs and Wozniak have become known as two of the most brilliant innovators in the technological revolution, not all of their (1) …….. were as successful as the Apple I and the Apple II. They (2) …….. the Apple II Plus in 1980 when they (3) ……..... that small businesses would have a need for a more professional and integrated system than the Apple I or II. The Apple II plus

was an advanced version of the Apple II that they aimed at the small business (4) ……... Unfortunately, they did not (5) ……..... the competition of the IBM Personal Computer. Although I was not the original (6) ……... of the personal computer, they had been the leader in the business machine industry for several decades, and they soon (7) …….. as the primary competition in the personal computer (8) ……..... IBM had many advantages over Apple: their engineering was done by a more experienced engineering staff, and their advertising was done by their more experienced (9) …….. staff. Since Apple had been so successful with the Apple I and the Apple II, the failure of their (10)……..... with the Apple II Plus was both (11) ……... and disappointing.

Lesson Four
Computer Systems

Computers can be divided into three main types, depending on their size and power.

Mainframe computers are the largest and most powerful. They can handle large amounts of information very quickly and can be used by many people at the same time. They usually fill a whole room and are sometimes referred to as mainframes or computer installations. They are found in large institutions like universities and government departments.

Minicomputers, commonly known as minis, are smaller and less powerful than mainframes. They are about the size of an office desk and are usually found in banks and offices. They are becoming less popular as microcomputers improve.

Microcomputers, commonly known as micros, are the smallest and least powerful. They are about the size of a typewriter. They can handle smaller amounts of information at a time and are slower than the other two types. They are ideal for use as home computers and are also used in education and business. More powerful microcomputers are gradually being produced; therefore they are becoming the most commonly used type of computers.

A computer can do very little until it is given some information. This is known as the input and usually consists of a program and some data

A program is a set of instructions, written in a special computer language, telling the computer what operations and processes have to be carried out and in what order they should be done Data, however, is the particular information that has to

be processed by the computer, e.g. numbers, names, measurements Data brought out of the computer is known as the output

EXAMPLE: A computer calculating 3 + 4 = 7 uses the following program and data:

PROGRAM	Add two numbers then display the result
INPUT DATA	3, 4
OUTPUT DATA	7

When a program is run, i.e. put into operation, the computer executes the program step by step to process the data. The same program can be used with different sets of data.

Information in the form of programs and data is called software, but the pieces of equipment making up the computer system are known as hardware.

The most important item of hardware is the CPU (Central Processing Unit). This is the electronic unit at the center of the computer system It contains the processor and the main memory.

The processor is the brain of the computer. It does all the processing and controls all the other devices in the computer system.

The main memory is the part of the computer where programs and data being used by the processor can be stored. However it only stores information while the computer is switched on and it has a limited capacity.

All the other devices in the computer system, which can be connected to the CPU, are known as peripherals. These include input devices, output devices and storage devices.

An input device is a peripheral, which enables information to be fed into the computer. The most commonly used input device is a keyboard, similar to a typewriter keyboard.

An output device is a peripheral, which enables information to be brought out of the computer, usually to display the processed data. The most commonly used output device is a specially adapted television known as a monitor or VDU (Visual Display Unit). Another common output device is a printer. This prints the output of the CPU onto paper.

A storage device is a peripheral used for the permanent storage of information. It has a much greater capacity than the main memory and commonly uses magnetic tape or magnetic disks as the storage medium.

These are the main pieces of hardware of any computer system whether a small "micro" or a large mainframe system.

Keywords

- **Cursor** - Movable indicator on computer screen; as, He put the cursor after the last typed word.
- **Network** - System of electronically joined computers; as, A network offers many opportunities for sharing information.
- **Download** - To copy a file or program onto a personal computer; as, She downloaded the transcript of the trial.
- **Virus** - Digital infection or poison; as, The virus wreaked havoc with the bank's accounting.
- **Browser** - Software that allows you to explore, or browse the internet.

- **Cracker** - Intruder; someone who breaks into, or cracks computer systems; as, In the film Mission: Impossible, Tom Cruise enters a high-security area with the aid of a cracker.
- **Hit** - visit to a Web site.
- **Authenticate** - To confirm the identity of a computer user; as, Admittance was denied when the computer could not authenticate him.
- **Boot** - To start up a computer.
- **Server** - Central computer sharing resources and data with other computers on a network
- **Modem** - Connecting device between computers over a phone line; as, The Journalist submitted her article by modem.
- **Glitch** - Error; malfunction; as, A telecommunications glitch nearly wiped out the stockbroker's on-line trading.
- **Compress** -To shrink; store data in less space; as, The manuscript was compressed on a single floppy disk
- **Pixel** - Picture element; basic unit of an on-screen image.
- **Link** - Related site on Internet.
- **Scanner** - Machine that reproduces images onto a computer.
- **Log on** - To gain access to a computer network; as, A user ID and password will help you log on.
- **Shareware** - Free trial software often requiring later payment.
- **Gigabyte** - Unit of storage, roughly a billion bytes; as, A gigabyte of work was saved on her home computer.

Exercises

A. Answer the following questions.

1. What type of computer is most suitable for home use?

2. What is a program?

3. What are the functions of main memory, input device, and storage device?

4. What is data?

5. What are the functions of processor, output device, monitor?

B. Match each component in column A with its function in column B:

A	B
1. Storage device	a. It displays the processed data
2. Input device	b. It holds the programs and data being used by the processor
3. Output device	c. It does all the processing and controls the peripherals
4. Main memory	d. It allows data to be entered
5. Processor	e. It provides permanent storage for programs and data

Lesson Five
Computer Crimes

More and more, the operations of our businesses, governments, and financial institutions are controlled by information that exists only inside computer memories. Anyone clever enough to modify this information for his own purposes can reap substantial rewards. Even worse, a number of people who have done this and been caught at it have managed to get away without punishment.

These facts have not been lost on criminals or would be criminals. A recent Stanford Research Institute study of computer abuse was based on 160 case histories, which probably are just the proverbial tip of the iceberg. After all, we only know about the unsuccessful crimes. How many successful ones have gone undetected is anybody's guess.

Here are a few areas in which computer criminals have found the pickings all too easy.

Banking. All but the smallest banks now keep their accounts on computer files. Someone who knows how to change the numbers in the files can transfer funds at will. For instance, one programmer was caught having the computer transfer funds from other people's accounts to his wife's checking account. Often, traditionally trained auditors don't know enough about the workings of computers to catch what is taking place right under their noses.

Business. A company that uses computers extensively offers many opportunities to both dishonest employees and clever outsiders. For instance, thief can have the computer ship the company's products to addresses of his own choosing. Or he can

have it issue checks to him or his confederates for imaginary supplies or ser vices. People have been caught doing both.

Credit Cards. There is a trend toward using cards similar to credit cards to gain access to funds through cash-dispensing terminals. Yet, in the past, organized crime has used stolen or counterfeit credit cards to finance its operations. Banks that offer afterhours or remote banking through cash-dispensing terminals may find themselves unwillingly subsidizing organized crime.

Theft of Information. Much personal information about individuals is now stored in computer files. An unauthorized person with access to this information could use it for blackmail. Also, confidential information about a company's products or operations can be stolen and sold to unscrupulous competitors. (One attempt at the latter came to light when the competitor turned out to be scrupulous and turned in the people who were trying to sell him stolen information.)

Software Theft. The software for a computer system is often more expensive than the hardware. Yet this expensive software is all too easy to copy. Crooked computer experts have devised a variety of tricks for getting these expensive programs printed out, punched on cards, recorded on tape, or otherwise delivered into their hands. This crime has even been perpetrated from remote terminals that access the computer over the telephone.

Theft of Time-Sharing Services. When the public is given access to a system, some members of the public often discover how to use the system in unauthorized ways. For example, there are the "phone freakers" who avoid long distance telephone charges by sending over their phones control signals that are identical to those used by the telephone company.

Since timesharing systems often are accessible to anyone who dials the right telephone number, they are subject to the same kinds of manipulation.

Of course, most systems use account numbers and passwords to restrict access to authorized users. But unauthorized persons have proved to be adept at obtaining this information and using it for their own benefit. For instance, when a police computer system was demonstrated to a school class, a precocious student noted the access codes being used; later, all the student's teachers turned up on a list of wanted criminals.

Perfect Crimes. It's easy for computer crimes to go undetected if no one checks up on what the computer is doing. But even if the crime is detected, the criminal may walk away not only unpunished but with a glowing recommendation from his former employers.

Of course, we have no statistics on crimes that go undetected. But it's unsettling to note how many of the crimes we do know about were detected by accident, not by systematic audits or other security procedures. The computer criminals who have been caught may have been the victims of uncommonly bad luck.

For example, a certain keypunch operator complained of having to stay overtime to punch extra cards. Investigation revealed that the extra cards she was being asked to punch were for fraudulent transactions.

Unlike other embezzlers, who must leave the country, commit suicide, or go to jail, computer criminals sometimes brazen it out, demanding not only that they not be prosecuted but also that they be given good recommendations and perhaps other benefits, such as severance pay. All too often, their demands have been met.

Why? Because company executives are afraid of the bad publicity that would result if the public found out that their computer had been misused. They cringe at the thought of a criminal boasting in open court of how he juggled the most confidential records right under the noses of the company's executives, accountants, and security staff. And so another computer criminal departs with just the recommendations he needs to continue his exploits elsewhere.

Exercises

A. True or false?

1. A person is innocent until proven guilty.
2. Computer-related crime has diminished.
3. A thief can transfer funds from other people's accounts.
4. Dishonest employees can't ship the company's products to addresses of their choosing.
5. It is impossible to counterfeit credit cards.
6. Phone freaks can be found out.
7. Personal information should not be stored in computer files.
8. A real bank checks very carefully before handling out any money.
9. Unauthorized persons have proved to be inefficient laymen.
10. Hardware is less expensive than software.
11. Computer criminals will never be caught.
12. Companies don't punish some criminals because they don't want bad publicity.

B. Give synonyms to:

- Confidential=……..
- Attempt=……..

- To deliver=……..
- Merchandise=……..
- Transaction=……..

C. Give antonyms to:

- Fraudulent#.....
- Common#.....
- Former#.....
- By accident#.....

Lesson Six
Computer Security

The computer industry has been extremely vulnerable in the matter of security. Computer security once meant the physical security of the computer itself - guarded and locked doors. Computer screens were given dark filters so others could not easily see the data on the screen. But filters and locks by no means prevented access. More sophisticated security means safeguarding the computer system against such threats as burglary, vandalism, fire, natural disasters, theft of data for ransom, industrial espionage, and various forms of white-collar crime.

Emphasis on Access and Throughput. For the last decade or so, computer programmers have concentrated on making it easy for people to use computer systems. Unfortunately, in some situations the systems are all too easy to use; they don't impose nearly enough restrictions to safeguard confidential information or to prevent unauthorized persons from changing the information in a file.

It's as if a bank concentrated all its efforts on handing out money as fast is it could and did very little to see that the persons who requested the money were entitled to it. Of course, a real bank works just the opposite way, checking very carefully before handing out any money. Computer systems that handle sensitive personal and financial data should be designed with the same philosophy in mind.

Positive Identification of Users. A computer system needs a sure way of identifying the people who are authorized to use it. The identification procedure has to be quick, simple, and convenient. It should be so thorough that there is little chance of the computer being fooled by a clever imposter. At the same time, the computer must not reject legitimate users. Unfortunately, no identification system currently in use meets all these requirements.

At present, signatures are widely used to identify credit-card holders, but it takes an expert to detect a good forgery. Sometimes even a human expert is fooled, and there is no reason to believe that a computer could do any better.

A variation is to have the computer analyze a person's hand movements as he signs his name instead of analyzing the signature itself. Advocates of this method claim that different persons' hand movements are sufficiently distinct to identify them. And while a forger might learn to duplicate another person's signature, he probably would not move his hand exactly the way the person whose signature he was forging did.

Photographs are also sometimes used for identification. But, people find it inconvenient to stop by a bank or credit card company and be photographed. Companies might lose business if they made the pictures an absolute requirement. Also, photographs are less useful these days, when people frequently change their appearance by changing the way they wear their hair. Finally, computer programs for analyzing photographs are still highly experimental.

Cash-dispensing systems often use two identification numbers: one is recorded on a magnetic stripe on the identification card, and the other is given to the cardholder. When the user inserts his card into the cash-dispensing terminal, he keys in the identification number he has been given. The computer checks to see that the number recorded on the card and the one keyed in by the user both refer to the same person. Someone who stole the card would not know what number had to be keyed in to use it. This method currently is the one most widely used for identifying computer users.

For a long time, fingerprints have provided a method of positive identification. But they suffer from two problems, one technical and one psychological.

The technical problem is that there is no simple system for com paring fingerprints electronically. Also, most methods of taking fingerprints are messy. The psychological problem is that fingerprints are strongly associated in the public mind with police procedures. Because most people associate being fingerprinted with being arrested, they almost surely would resist being fingerprinted for routine identification.

Voiceprints may be more promising. With these, the user has only to speak a few words into a microphone for the computer to analyze his voice. There are no psychological problems here. And technically it's easier to take and analyze voiceprints than fingerprints. Also, for remote computer users, the identifying words could be transmitted over the telephone.

However, voiceprints still require more research. It has yet to be proved that the computer cannot be fooled by mimics. Also, technical difficulties arise when the voice is subjected to the noise and distortion of a telephone line.

Even lip prints have been suggested. But it's doubtful that kissing computers will ever catch on.

To date, the most reliable method of positive identification is the card with the magnetic stripe. If the technical problems can be worked out, however, voiceprints may prove to be even better.

Data Encryption. When sensitive data is transmitted to and from remote terminals, it must be encrypted (translated into a secret code) at one end and decrypted (translated back into plain text) at the other. Files also can be protected by encrypting the data before storing it and decrypting it after it has been retrieved.

Since it is impractical to keep secret the algorithms that are used to encrypt and decrypt data, these algorithms are designed so that their operation depends on a certain data item called the key. It is the key that is kept secret. Even if you know all the details of the encrypting and decrypting algorithms, you cannot decrypt any messages unless you know the key that was used when they were encrypted.

For instance, the National Bureau of Standards has adopted an algorithm for encrypting and decrypting the data processed by federal agencies. The details of the algorithm have been published in the Federal Register. Plans are under way to incorporate the algorithm in special purpose microprocessors, which anyone can purchase and install in his computer.

So the algorithm is available to anyone who bothers to look it up or buy one of the special purpose microprocessors. But the operation of the algorithm is governed by a sixty-four-bit key. Since there are about 1022 possible sixty-four-bit keys, no one is likely to discover the correct one by chance. And, without the correct key, knowing the algorithm is useless.

A recent important development involves what are called public-key cryptosystems.

In a public-key cryptosystem, each person using the system has two keys, a public key and a private key. Each person's public key is published in a directory for all to see; each person's private key is kept secret. Messages encrypted with a person's public key can be decrypted with that person's (but no one else's) private key. Messages encrypted with a person's private key can be decrypted with that person's (but no one else's) public key.

Protection through Software. The software of a computer system, particularly the operating system, can be designed to prevent unauthorized access to the files stored on the system.

The protection scheme uses a special table called a security matrix.

	Data A	Data B	Data C
User A	Read Modify Execute	Modify	Read
User B	Read	Modify Execute	Modify
User C	Read Modify	Read Execute	Read

Each row of the security matrix corresponds to a data item stored in the system. Each entry in the table lies at the intersection of a particular row and a particular column. The entry tells what kind of access the person corresponding to the row in which the entry lies has to the data item corresponding to the column in which the entry lies.

Usually, there are several kinds of access that can be specified. For instance, a person may be able to read a data item but not change it. Or he may be able to both read and modify it. If the data is a program, a person may be able to have the

computer execute the program without being able either to read or modify it. Thus, people can be allowed to use programs without being able to change them or find out how they work.

Needless to say, access to the security matrix itself must be restricted to one authorized person.

Also, the software has to be reliable. Even the software issued by reputable vendors may be full of bugs. One or more bugs may make it possible for a person to circumvent the security system. The security provisions of more than one computer system have been evaded by high school and college students.

Restricting the Console Operator. Most computer systems are extremely vulnerable to the console operator. That's because the operator can use the switches on the computer's control panel to insert programs of his own devising, to read in unauthorized programs, or to examine and modify confidential information, including the security matrix. In the face of these capabilities, any software security system is helpless. Computer systems for handling sensitive information must be designed so that the console operator, like other users, works through the software security system and cannot override it. One solution is to incorporate the security system in firmware instead of software, so that unauthorized changes to it cannot be made easily.

Exercises

A. Give synonyms to:

- To encrypt=…….
- To secure=…….
- Confidential=…….

- To incorporate=…….
- Unless=…….

B. Give antonyms to:

- Convenient#.....
- Advocate#.....
- To encrypt#.....
- Sensitive#.....
- Private #.....

C. Answer the Questions:

1. W hat is computer security?
2. What is the most serious problem: the loss of hardware, software, or the loss of data?
3. How does a computer system detect whether you are the person who should be granted access to it?
4. What are the shortcomings of each biometric means?
5. What is to prevent any user from copying PC software onto diskettes?
6. What steps can be taken to prevent theft or alteration of data?
7. What is the weakest link in any computer system?
8. Should a programmer also be a computer operator?
9. What is a security matrix?

D. Put the proper words into sentences:

Foolproof, Complicated, Virus, Unauthorized, Crime, Fingerprint, Altering, Messages

1. Computer security is more …….. today than it was in the past.
2. International literature tells lurid stories about computer viruses ……... about bank swindles, espionage,……... sent from one computer to destroy the contents of others.
3. Movies like War Games have dramatized the dangers from ……... entry to the computer systems that control nuclear weapons.
4. Methods used in computer-based criminal activity range from switching or ……..... data as they enter the computer, to pulling self-concealing instruction into the software.
5. The person who develops a ……... lock for the computer data will make a fortune.
6. ……... is the name generally given to software that causes ……... of computer files.
7. People must be taught that some kinds of help, such as assisting ……..... users with passwords are inappropriate.
8. According to a published article, the Mafia has kidnapped an IBM executive and cut off his finger because it needed his ……... to breach a computer security system.
9. Data sent over communication lines can be protected by encryption, the process of scrambling ……...
10. Firewall is security measures taken to block ……..... access to an Internet site.

Lesson Seven
Virtual Reality

One of the most exciting new areas of computer research is virtual reality. Having been featured in TV sitcoms as well as public television documentaries, virtual reality is merely an ambitious new style of computer interface. Virtual reality creates the illusion of being in an artificial world - one created by computers.

Virtual reality visitors strap on a set of eyephones, 3D goggles that are really individual computer screens for the eyes. Slipping on the rest of the gear allows you not only to see and hear, but also to sense your voyage. The world of virtual reality has been called cyberspace, a computer-enhanced fantasy world in which you move around and manipulate objects to your mind's content.

When you move your head, magnetic sensors instruct the computer to refocus your eye phones to your new viewpoint. Sounds surround you, and fiber-optic glove allows you to “manipulate” what you see. You may see. out strange new worlds, fight monsters in computer combat, or strap yourself into the seat of a Star Wars-type jet and scream through cyberspace, blasting all comers to oblivion (computer oblivion, at least). Or, with your stomach appropriately settled, you might even try out the most incredible roller coaster ride you will ever take in your life.

For the disabled, virtual reality promises a new form of freedom. Consider the wheelchair bound paraplegic child who is suddenly able to use virtual reality gear to take part in games like baseball or basketball. Research funded by the government takes a military point of view, investigating the possibility of sending robots into the real conflict while human beings don cyberspace gear to guide them from back in the lab.

Spectrum Holobyte, a computer games development company, announced its first virtual reality computer game for the home during 1991 Christmas season. Imagine yourself suddenly clutching your handheld laser pistol as a giant bird swoops right at you from the age of dinosaurs! Your laser shot goes astray, and you feel yourself suddenly lifted off the ground and carried higher and higher. That's enough - for some of us it can be virtually too real.

Exercises

A. True or false?

1. Virtual reality is a computer-built fantasy world.
2. Virtual reality is also called cyberspace.
3. There are no limits to virtual reality.
4. Virtual reality is created by being in a special room.
5. Virtual reality is available only on expensive computer systems.
6. Virtual reality is the leading edge of the computer technology.
7. Eyephones are the 3DFX fiber-optic glasses.
8. Eyephones are not the only virtual reality gear.
9. Virtual reality might be misused.
10. Virtual reality can return the disabled to the full-fledged life.
11. Virtual reality was designed by the military to guide robots.
12. One can not only see or hear virtual reality, but also feel and smell it.
13. Virtual reality is only a type of computer interface.

B. Put the proper words into sentences:

Fiber-Optic, Swoop, Go Astray, Clutching, Gear, To One's Mind Content, Enhance, Cyberspace, Eye Phones

1. Virtual reality is sometimes called.....
2. 3-D ……... are really individual computer screens for the eyes.
3. Virtual reality can …….. possibilities of the disabled.
4. The manual ……... box allows you to slow down without braking, while the automatic one doesn't.
5. Cyberspace allows everybody to change it……..
6. The letters wrongly addressed……..
7. ……... unknown things may cause an accident.
8. By the end of the 20th century metal wires had been replaced by ..... ones.
9. In one of the ……..... the NATO has lost their most expensive fighter.

Lesson Eight
IT Revolution

What is more impressive than the pyramids, more beautiful than Michelangelo's David and more important to mankind than the wondrous inventions of the Industrial Revolution? To the converted, there can be only one answer: the Internet that undisciplined radical electronic communications network that is shaping our universe. Multimedia, the electronic publishing revolution, is entering every area of our lives - college, work and home. This new digital technology combines texts, video, sound and graphics to produce interactive language learning, football, music, movies, cookery and anything else you might be interested in.

The industrial age has matured into the information age; wherein the means to access, manipulate, and use information has become crucial to success and power. The electronic superhighway provides an entry to libraries, research institutions, databases, art galleries, and census bureau's, etc. For those of us interested in intercultural communications Cyberspace is a universal community, with instant access not only to information anywhere, but also to friends old and new around the globe.

The Internet is an amorphous global network of thousands of linked computers that pass information back and forth. While the Internet has no government, no owners, no time, no place, no country, it definitely has a culture, which frequently approaches anarchy; and it has a language, which is more or less English. People who inter act in an Internet environment know how addresses are formed, how to use email, ftp, Usenet News, Telnet, and other software tools.

Like all new worlds, Cyberspace has its own lingo, for example: e-bahn, i-way, online, freenet, web page, freeware, browser, gopher, archie, gateway. There are words to describe people who roam the net: netters, e-surfers, internet surfers, netizens, spiders, geeks... The Internet has its own prerogatives: for example, the dismissive term lurker for the person who hangs around the net, reading what is there but not contributing anything. The term flaming refers to the public humiliation of another netter as punishment for a real or imagined transgression against net culture.

Large-scale use of computer-to-computer transfer of information was implemented by the US military in the late 60s and early 70s - part of the superpower competition of the cold war and the arms race. The US military created an electronic network (Arpanet) to use computers for handling the transfer of large amounts of sensitive data over long distances at incredible speed. Computer-to-computer virtual connections, using satellites and fiber optics, have distinct advantages over telephone or radio communications in the event of a nuclear attack. Mathematicians and scientists (and their universities) have been linked and electronically exchanging information over the Internet since the mid70s.

Now the Internet has become commercialized with private and public companies offering access to it. (CompuServe - is the best-known international commercial electronic access provider). The Internet is being expanded and improved so that every home, every school, every institution can be linked to share data, information, music, video and other resources. If you have a computer or a computer terminal, some kind of connection (probably, modem and telephone line) to the Internet, and some kind of Internet service provider, you can participate in electronic communication and become a citizen of the global village.

Information technology is a good vehicle for the argument. Some scientists remind us that voluminous information does not necessarily lead to sound thinking. There are many genuine dangers that computers bring to modern society: efficient invasion of privacy, overreliance on polling in politics, even abdication of control over military decision-making. Data glut obscures basic questions of justice and purpose and may even hinder rather than enhance our productivity. Edutainment software and computer games degrade the literacy of children. On the other hand, only a few use Cs on network to share information and ideas. In most cases IT is used to speed routine tasks, to automate manual processes rather than to change work patterns and business practices. Most managers use their PCs to edit documents - not a good use of their time when they could be dreaming up creative applications. It is time to evaluate anew the role of science and technology in the affairs of the human species.

So, if you are riding on the information highway, you should take steps to cope with information overload. The gift of boundless information is causing a new kind of stress known alternately as technostress, information overload or Information Fatigue Syndrome. Some experts say that we don't get anywhere near the data it takes to overload our neurons. According to some estimates, our mind is capable of processing and analyzing many gigabytes of data per second - a lot more data than any of today's supercomputers can process and act on in real time. We feel overloaded by the quantity of information because we are getting it unfiltered. We should filter out the junk and turn data into shapes that make sense to us. Stress in moderation is good: it drives us to achieve, stimulates our creativity and is the force behind social and technological breakthroughs. Stress is revealing how humans are in some ways more primitive than the technology they have created. Meditation, muscular relaxation, aerobics, jogging, yoga can be effective stress

relievers, but no technique is universal: experiment and find the one that best works for you.

The cornerstones of an economy are land, labor, capital and entrepreneurial spirit. That traditional definition is now being challenged. Today you find a fifth key economic element: information dominant. As we evolve from an industrial to an information society, our jobs are changing from physical to mental labor. Just as people moved physically from farms to factories in the Industrial age, so today people are shifting muscle power to brain power in a new, computer-based, globally linked by the Internet society.

Exercises

A. Define the following terms:

- E-Mail
- Byte
- Browser
- Zoom
- Bug
- Cursor
- Buffer
- Download
- Gateway

B. Put the proper words into sentences:

Multimedia, Dominant, Spider, Netizen, Flame, Writing, Foolproof, Technostress, Zoom.

1. Please, don't ..... me if you disagree with this.
2. The person who develops a ..... lock for computers data will make a fortune.
3. ..... a person or computer program that searched the web for new links and link them to the search engine.
4. ..... spends an excessive amount of time on the internet.
5. Windows and Unix operating systems are going to be on the desktops and on servers in ..... numbers (B. Gates)
6. Hit a video button and .....for a closer look.
7. .....bring together different types of visual devices: text, pictures, sounds, animations, speech.
8. Each person handles ..... differently.
9. Good ..... on the Net tends to be clear, vigorous, witty and above all brief: short paragraphs, bulleted lists, one-liners – the unit of thought.