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STUDYING TELECOMMUNICATIONS

Reader for Second Year Students of the Telecommunications Faculty

ИЗУЧАЯ ТЕЛЕКОММУНИКАЦИЮ

Пособие по развитию навыков чтения на английском языке
для студентов 2 курса ФТК БГУИР

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Главной целью данного пособия является научить студентов ФТК читать оригинальные английские и американские тексты по своей специальности. Также ставится задача максимально приблизить студентов к развитию, приобретению и закреплению навыков реферирования научной литературы по специальности, что является необходимой и неотъемлемой частью их будущей самостоятельной профессиональной деятельности.

Пособие состоит из двух частей. Первая часть содержит 12 уроков и предназначена для работы с текстом под руководством преподавателя, в то время как вторая часть предназначена для самостоятельной работы студентов и включает в себя 6 уроков.

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PART I.

GUIDED READING PRACTICE

UNIT 1.

TELECOMMUNICATIONS

I. Consider the following questions in the group of four. A spokesperson will report on your discussion to the whole group.

1. In what way do you communicate in your everyday life?
2. What is the most common means of communication nowadays? Why?
3. Can you name scientists working in the field of communication?
4. Is the system of communication well developed in our country?

II. Read the text below and check its comprehension.

History of Telecommunications

Communicating over long distances has been a challenge throughout history. In ancient times, runners were used *to carry* important between *messages* rulers or other important people. Other forms of *long-distance communication* included smoke signals, chains of searchlights and flags *to send a message* from one tower to another, carrier pigeons, and horses. Modern telecommunications began with the *discovery* that electricity can be used *to transmit a signal*. For the first time, a signal could be sent *faster* than any other *mode* of transportation. The first practical telecommunications *device* to make use of this discovery was *the telegraph*.

1. The Telegraph Beginning in the mid-1800s, the telegraph *delivered* the first inter-city, transcontinental, and transoceanic messages in the world. The telegraph revolutionized the way people communicated by *providing* messages faster than any other *means* provided at the time. American art professor Samuel F.B. Morse pursued an interest in electromagnetism to create a practical electromagnetic telegraph in 1837. Morse partnered with Alfred Vail and was able to commercialize the technology with financial *support* from the U.S. government. In 1843 Morse built a demonstration telegraph *link* between Washington, D.C., and Baltimore, Maryland. On May 24, 1844, the network was inaugurated for commercial use with the message, "What hath God wrought!"

Telegraph use quickly spread; the first transcontinental link was completed in 1861 between San Francisco, California, and Washington, D.C. Railroad companies and newspapers were the first major telegraphy users. Telegraph lines were constructed parallel to railroad beds. Telegraphy helped the railroads manage traffic and *allowed* news organizations to distribute stories quickly to local newspapers. Within a few years, several telegraph companies were in operation, each with its own *network* of telegraph wires. Consolidation occurred in the telegraph industry (as it has in numerous telecommunications industries), and by the 1870s the Western Union Telegraph Company *emerged* as the dominant operator.

2. Commercial Growth of the Telephone

In 1876 American inventor Alexander Graham Bell ushered in a new era of voice and sound telecommunication when he uttered to his assistant the words, "Mr. Watson, come here; I want you," using a prototype telephone. Bell *received* the patent for the first telephone, but he had to fight numerous legal challenges to his patent from other inventors with similar devices. Bell was able to make his prototype telephone work and attract financial backers, and his company grew. The telephone was a vast *improvement* over the telegraph system, which could only transmit coded words and numbers, not the sound of a human voice. Telegraph messages had to be deciphered by trained operators, written down, and then delivered by hand to the receiving party, all of which took time. The telephone transmitted actual sound messages and made telecommunication *immediate*. Improved *switching technology* (the technology used to transfer *calls* from one local network to another) meant individual telephones could be connected for personal conversations.

The first commercial telephone line was installed in Boston, Massachusetts, in 1877. Early telephones *required* direct connections to other telephones, but this problem was solved with telephone exchange switches, the first of which was *installed* in New Haven, Connecticut, in 1878. *A telephone exchange* linked telephones in a given area together, so a connection between the telephone and the exchange was all that was needed. Telephones were much more convenient and personal than telegrams, and their use quickly spread. By 1913 telephone lines from New York City to San Francisco had been established, and by 1930 radio signals could transmit telephone calls between New York and London, England. Eventually, long-distance telephone service in the United States was consolidated into one company, the American Telephone and Telegraph Company (now known as AT&T Corp.), which was a regulated monopoly.

3. The Emergence of Broadcasting

Telephones and telegraphs are *point-to-point systems* of telecommunications, but with the invention of the radio, *point-to-multipoint signals* could be sent through a central *transmitter* to be received by anyone possessing a *receiver*. Italian inventor and electrical engineer Guglielmo Marconi transmitted a Morse-code telegraph signal by radio in 1895. This began a revolution *in wireless telegraphy* that would later result in *broadcast* radios that could transmit actual voice and music. Radio and wireless telegraph communication played an important role during World War I (1914-1918), allowing military personnel to communicate instantly with troops in remote locations. United States president Woodrow Wilson was impressed with the ability of radio, but he was fearful of its potential for espionage use. He banned nonmilitary radio use in the United States as the nation entered World War I in 1917, and this stifled commercial development of the *medium.* After the war, however, commercial radio stations began to broadcast. By the mid-1920s, millions of radio listeners *tuned in* to music, news, and entertainment programming.

Television got its start as a mass-communication medium shortly after World War II (1939-1945). The expense of television transmission *prevented* its use as a

two-way medium, but radio broadcasters quickly saw the potential for television to provide a new way of bringing news and entertainment programming to people.

Government Regulation The number of radio broadcasts grew quickly in the 1920s, but there was no regulation of *frequency* use or transmitter strength. The result was a crowded radio band of *overlapping signals*. To remedy this, the U.S. government created the Federal Communications Commission (FCC) in 1934 to regulate the spreading use of the broadcast spectrum. The FCC licenses broadcasters and regulates the location and transmitting strength, or range, stations have in an effort to prevent interference from nearby signals.

4. International Telecommunications Networks

In order to provide overseas telecommunications, people had to develop networks that could link widely separated nations. The first networks to provide such linkage were telegraph networks that used *undersea cables*, but these networks could provide *channels* for only a few *simultaneous* communications. Shortwave radio also made it possible for wireless transmissions of both telegraphy and voice over very long distances.

To take advantage of the capability of *satellites* to provide telecommunications service, companies from all over the world pooled resources and shared risks by creating a cooperative known as the International Telecommunications Satellite Organization, or *Intelsat,* in 1964. Transoceanic satellite telecommunications first became possible in 1965 with the successful launch of Early Bird, also known as *Intelsat 1. Intelsat 1* provided the first international television transmission and had the capacity to handle one television channel along with 240 *simultaneous* telephone calls.

Intelsat has *expanded* and diversified to meet the global and regional satellite *requirements* of over 200 nations and territories. In response to private satellite ventures entering the market, the managers *of Intelsat* have sought to convert the cooperative into a corporation better able to compete with these emerging companies. A separate cooperative known as the International Mobile Satellite Organization (*Inmarsat*) primarily provides service to oceangoing vessels, but it has expanded operations to include service to airplanes and users in remote land areas not served by *cellular radio* or wireline services. *Inmarsat* also seeks to become a private corporation, because of competition from private satellite ventures.

5. Current Developments

Personal computers have pushed the limits of the telephone system as more and more *complex* computer messages are being sent over telephone lines, and at rapidly increasing speeds. This need for speed has encouraged the development of *digital transmission technology*. Innovations in *fiber-optic technology* will hopefully keep up with the growing use of personal computers for telecommunications. The next generation of cellular telephones, pagers, and televisions will also *benefit* from the speed and clarity of digital telecommunications.

Telecommunications and information technologies are *merging* and *converging.* This means that many of the devices that we associate with only one function may evolve into more *versatile* equipment. This convergence is already

happening in various fields. Some telephones and pagers are able *to store* not only phone numbers but also names and personal information about callers. Advanced phones with keyboards and small screens are now in development that can *access* the Internet and send and receive *e-mail*. Personal computers can now access information and video entertainment and are in effect becoming a combined television set and computer terminal. Television sets, which we *currently* associate with broadcast and cable-delivered video programming, are able to gain access to the Internet through add-on appliances. Future modifications and technology innovations may blur the distinctions between appliances even more.

Convergence of telecommunications technologies will also trigger a change in the content available and the composition of the content provider. Both television and personal computers will be incorporating new multimedia, interactive, and digital features. For example, an entertainment program might have on-screen pointers to World Wide Web pages containing more information about the actors. In the near term, before the actualization of a fully digital telecommunications world, devices like modems will still be necessary to provide an *essential* link between the old analog world and the upcoming digital one.

Comprehension Check Up

1. What forms of communication existed in ancient times? 2. What did modern communications begin with? 3. How did the telegraph revolutionize the way people communicated with each other? 4. When was a practical electromagnetic telegraph created? 5. Who opened a new era of voice and sound telecommunication? 6. What were the advantages of the telephone over the telegraph system? 7. What was the function of a telephone exchange? 8. What was established to regulate the spreading use of the broadcast spectrum? 9. Why was the International Telecommunications Satellite Organization (Intelsat) created? 10.What are the results of the convergence of telecommunications and information technologies?

III. Choose the best answer.

1. The word *to communicate* means …
   a) to give recommendations;
   b) to transmit or exchange information;
   c) to take urgent measures;
   d) to sign documents.
2. The word *means* refers to …
   a) Transport;
   b)sense;
   c) medium;
   d) measurement.
3. The best explanation of *simultaneous* might be …
   a) occurring at the same time;
   b) taking place from time to time;
   c) operating regularly;
   d) being similar.

4. The word *cable* means…

a) the power of an electrical device;

b) a device for transforming sound energy into electrical energy;

c) a system for conducting electric current;

d) a conductor for high electric current consisting of several wires twisted together.

5. The prefix *tele-* means …

a) not far from home;

b)TV; c) at a distance;

d) communication by means of videophones.

6. The word *mode* refers to …

a) Fashion;

b) type, kind;

c) control;

d) method or way of doing smth.

7. The word *emerge* implies …

a) to appear;

b) to receive;

c) to become well-known;

d) to seem.

8. The *Intelsalt* deals with …

a) Navigation;

b) developing the computer software;

c) satellite communication;

d) programming.

9. The word *to converge* implies…

a) to unite, to join;

b) to be sociable;

c) to get in touch;

d) to convert

IV. The Federal Communication Commission deals with …

a) giving permission to military personnel to communicate instantly with troops in remote location; b) regulation of frequency use or transmitter strength; c) making weather forecasts by means of satellites; d) putting an end to espionage.

1. The word allow *implies* …

a) to forbid; b) to agree; c) to foresee; d) to permit.

2. The best explanation of the word *versatile* might be

a) many-sided; b) vacant; c) limited; d) unsuitable

3. The word *currently* means …

a) in the near future; b) as soon as possible; c) instantly; d) at the present moment.

4. The word *essential* implies…

a) special; b) important; c) conventional; d) inaccurate.

V. Use the right verb from those given below:

to support, to expand, to access, to tune, to deliver; telephone exchange, network, to incorporate, overlapping, immediate

1. The first transcontinental and transoceanic messages in the world were … by the telegraph in the mid –1800s.
2. Several telegraph companies worked in the field, each having its own … of telegraph wires.
3. The financial … of the Us government made it possible for S. Morse to establish the network for commercial use.
4. Sound messages transmitted by the telephone made telecommunication … .
5. The problem of direct connections of early telephones to other ones was solved by the … .
6. The *Intelsat* has … operations in order to provide services to remote land areas.
7. By the mid – 1920s, millions of radio listeners … in to music, news and entertainment programming.
8. The fact that the number of radio broadcasts grew quickly and there was no regulation of the location and transmitting strength led to a crowded radio band of … signals.
9. The use of digital transmission technologies made it possible for advanced phones to … the Internet and send and receive e-mail.
10. In the future both television and personal computers will … new multimedia, interactive and digital features.

VI. Are the following statements True or False?

1. The telephone was the first practical telecommunications device.
2. The use of telephone spread quickly as it was much more convenient and personal than telegrams.
3. G. Marconi began a revolution in wireless telegraphy having transmitted a Morse-code telegraph signal by radio in 1895.
4. The *Intelsat* by means of satellites made it possible to provide transoceanic telecommunications.
5. The need for speed encouraged the development of analogue transmission technology.

VII. Divide the text into paragraphs.
VIII. Express the main idea of each paragraph in one sentence.
IX. Summarize the text and be ready to retell it.
X. Speak about the history of the development of telecommunication.

UNIT 2.

TELECOMMUNICATIONS: WHAT IS IT AND HOW DOES IT WORK?

I. Consider the following questions in the group of four. A spokes-person will report on your discussion to the whole group.

1. Why do you think telecommunications plays a vital role in our daily life?
2. Could you give us any examples of telecommunications systems?
3. What kinds of telecommunications systems do you use?
4. Can you imagine your life without them?
5. What can you say about the further development of telecommunications?

II. Read the text below and check its comprehension

Telecommunications: what is it and how does it work?

1. Introduction

Telecommunications embraces all devices and systems that *transmit* electronic signals across long distances. Telecommunications allows people around the world to contact one another, to access information instantly, and to communicate from remote areas. Telecommunications usually *involves* a sender of information and one or more recipients linked by a technology, such as a telephone system, that transmits information from one place to another. Telecommunications devices *convert* different types of information, such as sound and video, into electronic signals. The signals can then be transmitted by means of media such as telephone wires or radio waves. When a signal reaches its destination, the device on the receiving end converts the electronic signal back into an understandable message, such as sound over a telephone, moving images on a television, or words and pictures on a computer screen. Telecommunications enables people to send and receive personal messages across town, between countries, and to and from outer space. It also provides the key medium for news, data, information and entertainment.

Telecommunications messages can be sent in a variety of ways and by a wide range of devices. The messages can be sent from one sender to a single receiver (point-to-point) or from one sender to many receivers (point-to-multipoint). Personal communications, such as a telephone conversation between two people or a facsimile (fax) message (*see* Facsimile Transmission), usually involve point-to-point transmission. Point-to-multipoint telecommunications, often called *broadcasts*, provide the basis for commercial radio and television programming.

2. How Telecommunications Works

Telecommunications begin with *messages* that are converted into electronic signals. The signals are then sent over a medium to a receiver, where they are decoded back into a form that the person receiving the message can understand.

There are a variety of ways to create and decode signals, and many different ways to transmit signals.

A. Creating and Receiving the Signal

Devices such as the telegraph and telephone relay messages by creating modulated electrical impulses, or impulses that change in a systematic way. These impulses are then sent by wires, radio waves, or other media to a receiver that *decodes* the modulation. The telegraph, the earliest method of delivering telecommunications, works by converting the contacts (connections between two conductors that permit a flow of current) between a telegraph key and a metal conductor into electrical impulses. These impulses are sent along a wire to a receiver, which converts the impulses into short and long bursts of sound or into dots and dashes on a simple printing device. Specific sequences of dots and dashes represent letters of the alphabet. In the early days of the telegraph, these sequences were decoded by telegraph operators (*see* Morse Code, International). In this way, telegraph operators could transmit and receive letters that spelled words. Later versions of the telegraph could decipher letters and numbers automatically. Telegraphs have been largely *replaced* by other forms of telecommunications, such as fax machines and electronic mail (e-mail), but they are still used in some parts of the world to send messages.

The telephone uses a *diaphragm* (a small membrane) connected to a magnet and a wire coil to convert sound into electrical impulses. When a person speaks into the telephone's microphone, sound waves created by the voice move the diaphragm, which in turn creates electrical impulses that are sent along a telephone wire. The receiver's wire is connected to a speaker, which converts the modulated electrical impulses back into sound.

Broadcast radio and cellular radio telephones are examples of devices that create signals by modulating radio waves. A radio wave is one type of electromagnetic radiation, a form of energy that *travels* in waves. *Microwaves* are also electromagnetic waves, but with shorter wavelengths and higher frequencies. In telecommunications, a transmitter *creates* and *emits* radio waves. The transmitter electronically encodes sound or other information onto the radio waves by varying either the amplitude (height) of the radio waves, or by varying the *frequency* (number) of the waves within an established range (*see* Frequency Modulation). A receiver (tuner) tuned to a specific frequency or range of frequencies will pick up the modulation added to the radio waves. A speaker connected to the tuner converts the modulation back into sound.

Broadcast television works in a similar fashion. A television camera takes the light reflected from a scene and converts it into an electronic signal, which is transmitted over high-frequency radio waves. A television set contains a tuner that receives the signal and uses that signal to modulate the images seen on the picture tube. The picture tube *contains* an electron gun that shoots electrons onto a photo-sensitive display screen. The electrons illuminate the screen wherever they fall, thus creating moving pictures.

Telegraphs, telephones, radio, and television all work by modifying electronic signals, making the signals imitate, or reproduce, the original message. This form of transmission is known as analog transmission. Computers and other types of electronic equipment, however, transmit digital information. Digital technologies convert a message into electronic form first by measuring different qualities of the message, such as the pitch and volume of a voice, many times. These measurements are then *encoded* into multiple series of binary numbers, or 1s and 0s. Finally, digital technologies create and send electrical impulses that correspond to the series of 1s and 0s. Digital information can be transmitted faster and more clearly than analog signals, because the electrical impulses only need to correspond to two digits and not to the full range of qualities that compose the original message, such as the pitch and volume of a human voice. While digital transmissions can be sent over wires, cables or radio waves, they must be decoded by a digital receiver. New digital telephones and televisions are being developed to make telecommunications more efficient.

Most personal computers *communicate* with each other and with larger *networks*, such as the Internet, by using the ordinary telephone network. Since the telephone network functions by converting sound into electronic signals, the computer must first convert its digital data into sound. Computers do this with a device called a modem, which is short for modulator/demodulator. A modem converts the stream of 1s and 0s from a computer into an analog signal that can then be transmitted over the telephone network, as a speaker's voice would. The modem of the receiving computer demodulates the analog sound signal back into a digital form that the computer can understand.

B. Transmitting the Signal

Telecommunications systems *deliver* messages using a number of different transmission media, including copper *wires*, fiber-optic cables, communication satellites, and microwave radio. One way to categorize telecommunications media is to consider whether or not the media uses wires. Wire-based (or wireline) telecommunications provide the initial link between most telephones and the telephone network, and are a reliable means for transmitting messages. Telecommunications without wires, commonly referred to as wireless communications, use technologies such as cordless telephones, cellular radio telephones, walkie-talkies, citizens band (CB) radios, pagers, and satellites. Wireless communications offer increased mobility and flexibility.

Wires and cables were the original medium for telecommunications and are still the primary means for telephone connections. Wireline transmission evolved from telegraph to telephone service and continues *to provide* the majority of telecommunications services. Wires connect telephones together within a home or business and also connect these telephones to the nearest telephone switching facility.

Other wireline services *employ* coaxial cable, which is used by cable television to provide hundreds of video channels to *subscribers*. Much of the content transmitted by the coaxial cable of cable television systems is sent by satellite to a central location known as the *headend*. Coaxial cables flow from the headend

throughout a community and onward to individual residences and, finally, to individual television sets. Because signals weaken as distance from the headend increases, the coaxial cable network includes amplifiers that process and retransmit the television signals.

Fiber-optic cables are cables made of specially treated glass that can transmit signals in the form of pulsed beams of laser light. Fiber-optic cables carry many times more information than copper wires can, and are able to transmit several television channels or thousands of telephone conversations at the same time. Fiber-optic technology is being used to replace copper wires in transoceanic cables and cables in other areas where large amounts of *data* are sent. New improvements promise cables that can transmit millions of telephone calls over a single fiber.

Wireless telecommunications use radio waves, sent through space from one antenna to another, as the medium for communication. Radio waves are used for receiving AM and FM radio and for receiving television. Cordless telephones and wireless radio telephone services, such as cellular radio telephones and pagers, also use radio waves. Telephone companies use microwaves to send signals over long distances. Microwaves use higher frequencies than the radio waves used for AM, FM, or cellular telephone transmissions, and they can transmit larger amounts of data more efficiently. Microwaves have characteristics similar to those of light waves, and transmit pencil-thin beams that can be received using dish-shaped antennas. Such narrow beams can be focused to a particular destination and provide reliable transmissions over short distances on earth. Even higher and narrower beams provide the high-capacity links to and from satellites. The high frequencies easily penetrate the ionosphere (a layer of the earth's atmosphere that blocks low-frequency waves) and provide a high-quality signal.

Communications *satellites* provide a means of transmitting telecommunications all over the globe, without the need for a network of wires and cables. They orbit the earth at a speed that *allows* them to stay above the same place on the earth at all times. This type of orbit is called geostationary orbit. The satellites receive transmissions from earth and transmit them back to numerous earth station receivers scattered within the receiving coverage area of the satellite. This relay function makes it possible for satellites to operate as "bent pipes," that is, wireless transfer stations for point-to-point and point-to-multipoint transmissions. Communications satellites are used by telephone and television companies to transmit signals across great distances. Ship, airplane, and land navigators also receive signals from satellites to determine geographic positions.

3. Telecommunications Systems

Individual people, businesses, and governments use many different types of telecommunications systems. Some systems, like the telephone system, use a network of cables, wires, and switching stations for point-to-point communication. Other systems, such as radio and television, broadcast signals through space, which can be received by anyone who has a device to receive them. Some systems make use of several types of media to complete a transmission. For example, a telephone call may

travel by means of copper wire, fiber-optic cable, and radio waves as the call is sent from sender to receiver. All telecommunications systems are constantly evolving as telecommunications technology improves.

A. Telegraph

Telegraph services use both wireline and wireless media for transmissions. Soon after the introduction of the telegraph in 1844, telegraph wires spanned the country. Telegraph companies maintained a system of wires and offices located in numerous cities. A message sent by telegraph was called a telegram. Telegrams were printed on paper and delivered to the receiving party by the telegraph company. With the invention of the radio in the early 1900s, telegraph signals could also be sent by radio waves. Wireless telegraphy made it practical for oceangoing ships as well as aircraft to stay in constant contact with land-based stations.

B. Telephone

The telephone network also uses both wireline and wireless methods to deliver voice communications between people, and data communications between computers and people or other computers. The part of the telephone network that currently serves individual residences and many businesses operates in an analog mode and relays electronic signals that are continuous, like the human voice. Digital transmission is now used in some sections of the telephone network that send large amounts of calls over long distances. However, since the rest of the telephone system is still analog, these digital signals must be converted back to analog before they reach users. The telephone network is stable and reliable, because it uses its own wire system that is powered by low-voltage direct current from the telephone company. Telephone networks modulate voice communications over these wires. A complex system of network switches maintains the telephone links between callers. Telephone networks also use microwave relay stations to send calls from place to place on the ground.

Comprehension Check up

1. What does telecommunications mean?
2. What is telecommunications used for?
3. How can telecommunications messages be sent?
4. How does the telegraph relay messages?
5. How does the telephone create signals?
6. What waves are used in telecommunications?
7. How does broadcast television work?
8. Can you explain the difference between analog and digital transmission?
9. What makes telecommunications more efficient?
10. What devices convert digits into sound?
11. What kinds of transmission media do you know?
12. What do you know about applying wires and cables?
13. Where are coaxial cables employed?
14. What are the advantages of fiber-optic cables?
15. What is the difference between using radio waves and microwaves?

16. What have you learnt about communications satellites?

III. Choose the best answer

1. The word *frequency* means…
    a) a message;
    b) telegraph;
    c) a number of repetitions;
    d) media.
2. The word *microwave* refers to…
    a) a beam;
    b) a very short wave;
    c) a very long wave;
    d) wavelength.
3. The best explanation of the word *network* might be …
    a)connected system;
    b) broadcast;
    c) matrix;
    d) complex system of lines that cross.
4. The word *diaphragm* implies…
    a) a magnet;
    b) a wire coil;
    c) a microphone;
    d) a small membrane.
5. The word *head end* means …
    a) a central location;
    b) individual residence;
    c) analog transmission;
    d) an amplifier.
6. The word *data* implies
    a) a season;
    b) the day of a month;
    c) a number;
    d) facts, things certainly known.
7. The best explanation of the word *satellite* might be …
    a) a planet moving round another planet;
    b) an artificial object put in space;
    c) a person, state depending upon taking the lead from another;
    d) a walkie-talkie
8. The word *broadcasts* refers to …
    a) bursts of sounds;
    b) point-to-point telecommunications;
    c) moving picture;
    d) point-to-multipoint telecommunications.
9. The word *subscriber* means …

a) a painter;
b) a person who subscribes word combination;
c) a speaker; d) a person who sings.

10) The *to convert information* implies …
a) to receive information;
b) to send information;
c) to change from one form into another;
d) to apply information.

11. The word *message* refers to …
a) a letter;
b) a piece of news or a request, send to smb.;
c) an error;
d) a connection.

12) The word *wire* implies…
a) telephone;
b) pipeline;
c) wavelength;
d) metal drawn out into the form of a thread.

13. The word *transmission* means…
a) traveling;
b) smth. transmitted or being transmitted;
c) change;
d) translation.

14. The verb *to encode* refers to…
a) to send signals over long distances;
b) to focus on a particular destination;
c) to operate in high frequencies;
d) to put (a message) into code.

IV. Use the right verb from those given below:

to create, to contain, to replace, to employ, to decode to transmit, to deliver, to allow, to emit, to involve, to travel to communicate, to provide

1. Telecommunication systems … messages using a number of different transmission media.
2. Wireline transmission … the majority of telecommunication services.
3. A transmitter … and … radio waves.
4. The picture tube … an electron gun.
5. Computers … digital information.
6. Telegraphs … by fax machines and e-mail.
7. Some wireline services … coaxial cable.
8. Telecommunications usually … a sender of information and one or more recipients linked by a technology, transmitting information from one place to another.

9. A radio wave is a form of energy that … in waves.
10. A receiver … the modulation.
11. Most personal computers … with each other and with larger networks using the common telephone network.
12. A certain speed … satellites to stay above the same place on the Earth at all times.

V. Are the following statements True or False?

1. Nowadays Telegraphs are widely used in all parts of the world.
2. Telecommunications allows people around the world to contact one another and to access information instantly.
3. Fiber-optic cables carry less information than copper wires can.
4. Computers and other types of electronic equipment transmit analog information.
5. Telephone companies use microwaves to send signals over long distances.
6. Computers convert their data into sound with a device called a memory.

VI. Divide the text into paragraphs.
VII. Express the main idea of each paragraph in one sentence.
VII. Summarize the text and be ready to retell it.
IX. Tell us about the advantages and disadvantages of using telecommunications.

UNIT 3.

WIRELESS COMMUNICATIONS

I. Consider the following questions in the group of four. A spokesperson will report on your discussion to the whole group.

1. What means of wireless communications do you know?
2. What are the main principles of wireless communications?
3. What opportunities do wireless communications systems provide?
4. What are the merits and demerits of the wireless communications systems?
5. Can you describe the perspectives of using wireless communications systems in Belarus?

II. Read the text below and check its comprehension.

Wireless Communications

1. Introduction

Wireless communications are various telecommunications systems that use radio waves to carry signals and *messages* across distances. Wireless communications systems use devices called *transmitters* to generate radio waves. A microphone or other mechanism converts messages, like sounds or other data, into electronic impulses. The transmitters change, or modulate, the radio waves so they can carry the impulses, and then transmit the modulated radio signals across distances. Radio

receivers pick up these signals and *decode* them back into original messages. Commercial radio and television are also wireless telecommunications system, but radio and television are mainly public *broadcast* services rather than personal communications systems.

Wireless communications allow people greater flexibility while communicating, because they do not need to remain at a fixed location, such as a home or office. Wireless technologies make communications services more readily available than traditional wire-based services (such as ordinary telephones), which require the installation of *wires*. This is useful in places where only temporary communications services are needed, such as at outdoor festivals or large sporting events. These technologies are also useful for communicating in remote locations, such as mountains, jungles, or deserts, where telephone service might not exist. Wireless services allow people to communicate while in a car, airplane, or other moving vehicle. Police, fire, and other emergency departments use two-way radio to communicate information between vehicles that are already responding to emergency calls, which saves valuable time. Construction and utility workers frequently use hand-held radios for short-range communication and coordination. Many businesspeople use wireless communications, particularly cellular radio telephones, to stay in contact with colleagues and clients while traveling.

All wireless communications devices use radio waves to transmit and receive signals. These devices operate on different radio *frequencies* so that signals from one device will not overlap and interfere with nearby transmissions from other devices.

2. Principles of Wireless Communications

Wireless communications begin with a message that is *converted* into an electronic signal by a device called a transmitter. The transmitter uses an oscillator to generate radio waves. The transmitter modulates the radio wave to carry the electronic signal and then sends the modified radio signal out through space, where it is picked up by a receiver. The receiver decodes, or demodulates, the radio wave and plays the decoded message over a speaker. Wireless communications provide more flexibility than wire-based means of communication. However, there are some drawbacks. Wireless communications are limited by the *range* of the transmitter (how far a signal can be sent), and since radio waves travel through the atmosphere, they can be disturbed by electrical interferences (such as lightning) that cause static.

Wireless communications systems involve either one-way transmissions, in which a person merely receives notice of a message, or two-way transmissions, such as a telephone conversation between two people. An example of a device that sends one-way transmission is a pager, which is a radio receiver. When a person dials a pager number, the pager company sends a radio signal to the desired pager. The encoded signal triggers the pager circuitry and notifies the customer carrying the pager of the incoming call with a tone or a vibration, and often the telephone number of the caller. Advanced pagers can display short messages from the caller, or provide news updates or sports scores.

Two-way transmissions require both a transmitter and a receiver for sending and receiving signals. A device that functions as both a transmitter and a receiver is called a transceiver. Cellular radio telephones and two-way radios use transceivers, so that back-and-forth communication between two people can be maintained. Early transceivers were very large, but they have decreased in size due to advances in technology. Fixed-base transceivers, such as those used at police stations, can fit on a desktop, and hand-held transceivers have shrunk in size as well. Several current models of hand-held transceivers weigh less than 0.2 kg (0.5 lb).

3. Modes of Wireless Communications

Wireless communications systems have grown and changed as technology has improved. Several different systems are used today, all of which operate on different radio frequencies. New technologies are being developed to provide greater service and reliability.

A. Air Transceivers

Radio operators still monitor distress channels, but maritime and aviation telecommunications systems now use high-frequency radios and satellites capable of transmitting speech, rather than wireless telegraphy, to send messages. Aircraft pilots use radios to communicate with air traffic controllers at airports and also to communicate with other pilots. Navigation beacons are equipped with transmitters that send automated signals to help ships and aircraft in distress determine their positions. While high-frequency radio can transmit signals over long distances, the quality of these signals can be diminished by bad weather or by electrical interference in the atmosphere, which is often caused by radiation from the sun.

B. Hand-Held Radio Transceivers

Police, fire, and other emergency organizations, as well as the military, have used two-way wireless radio communication since the 1930s. Early vehicle-based radios were large, heavy units. After the invention of the transistor in 1948, radios shrank in size to small hand-held radio transceivers, which civil authorities now use to *communicate* with each other directly. Public two-way radios with several frequency options are widely available as well. Usually limited in range to a few miles, these units are great aids for such mobile professionals as construction workers, film crews, event planners, and security personnel. Simpler two-way radios, called walkie-talkies, have been popular children's toys for years.

C. Shortwave

Long-range broadcast services and frequencies, in what is known as the shortwave radio *band* (with frequencies of 3 to 30 megahertz), are available for amateur or ham radio operators. Shortwave radio broadcasts can travel long distances because of the concentration of ionized, or electrically *charged*, particles in the layer of the atmosphere known as the ionosphere. This layer reflects radio signals, sending signals that are transmitted upward back to earth. This skipping of waves against the

ionosphere can greatly increase the range of the transmitter. The degree of reflectivity of the ionosphere depends on the time of day.

D. Cellular Radio Telephones

Cellular radio telephones, or cell phones, combine their portable radio capability with the wired, or wireline, telephone network to provide mobile users with access to the rest of the public telephone system used by non-mobile callers. Modern cellular telephones use a network of several short-range antennas that connect to the telephone system. Because the antennas have a shorter range, frequencies can be reused a short distance away without interference.

E. Satellite Communications

Satellite communications services connect users directly to the telephone network from almost anywhere in the world. Special telephones are available to consumers that communicate directly with communications satellites orbiting the earth. The satellites transmit these signals to ground stations that are connected to the telephone system. These satellite services, while more expensive than cellular or other wireless services, give users access to the telephone network in areas of the world where no telephone service exists.

The number of companies offering wireless communications services has grown steadily in recent years. In 1988 about 500 companies offered cellular radio telephone (cell phone) services. By 1995 that number had grown to over 1500 companies serving millions of subscribers. Wireless communication is becoming increasingly popular because of the convenience and mobility it affords, the expanded availability of radio frequencies for transmitting, and improvements in technology.

Comprehension Check Up

1. What functions do transmitters perform?
2. What functions do receivers perform?
3. What are the advantages of wireless communications?
4. Has the number of companies offering wireless communications services grown steadily in recent years?
5. What are the main principles of wireless communications?
6. How does a pager work?
7. What devices use transceivers?
8. What can diminish the quality of high-frequency radio signals?
9. What devices are great aids for mobile professionals?
10. Why can shortwave radio broadcasts travel long distances?
11. What are cellular radio telephones used for?
12. What are the merits of satellite communications services.

III. Choose the best answer.

1. The word *message* means …
   a) a written request;
   b) a piece of news or a request sent to smb.;
   c) movement of the hand, head, etc. used with or instead of words;
   d) a signal.
2. The best explanation of the word *transmitter* might be…
   a) a part of an apparatus for receiving broadcast signals;
   b) a person who receives;
   c) a part of a telegraph or radio apparatus for sending out signals, messages, etc.;
   d) an instrument for recording oscillations.
3. The word *frequency* implies…
   a) Excitement;
   b) one swing of an electric charge;
   c) a vibrating movement;
   d) rate of occurrence; number of repetitions (at a given time).
4. The word *range* refers to …
   a) a variation between limits;
   b) a line of persons or things;
   c) a position in a scale;
   d) a category or class.
5. The word *wire* means…
   a) a radio set;
   b) metal drawn out into the form of a thread; c) a rope;
   d) elecric current
6. The best explanation of the word *broadcast* might be…
   a) to give or pass;
   b) to send out in all directions, esp. by radio or TV;
   c) to help with the hand;
   d) to pass by tradition, inheritance.
7. The verb *oscillate* means…
   a) to swing backwards and forwards as the pendulum of a clock does;
   b) to move regularly to and fro;
   c) to cause smb. to move in a certain direction by waving;
   d) to distribute

IV. Use the right word from those given below:

cellular, overlap, to decode, flexibility, converts, dials, band, circuitry, to communicate, charged.

1. One of the functions of radio receivers is … signals back into the original messagers.
2.Wireless communications provide people with greater … while communicating.
3. Many businessmen prefer to use … radio telephones to stay in contact with colleagues and clients.
4. Signals of wireless communications devices musn't … and interfere with nearby transmissions from other device.
5. Transmitter … a message into an electronic signal.
6. A radio signal is sent to the desired pager by the pager company when a person … a pager number.
7. The pager … is triggered by the encoded signal.
8. At present civil authorities use small hand-held radio transceivers … with each other directly.
9. Amateur or ham radio operators use the shortwave radio … .
10. Ionized or elecrically … particles in the layer of the atmosphere make shortwave radio broadcasts possible.

V. Are the following statements True or False?

1. The transmitters transmit the modulated radio signals across distances.
2. Commercial radio and television aren't wireless communications systems.
3. A person should remain at a fixed location, such as home or office while using wireless communications.
4. Traditional wire-based services make communications services more readily available than wireless technologies.
5. Wireless communications are useful in remote locations where telephone service might not exist.
6. The number of companies offering wireless communications services has decreased in recent years.
7. The transmitter decodes, or demodulates, the radio wave and plays the decoded message over a speaker.
8. The range of the transmitter doesn't limit wireless communications.

VI. Express the main idea of each parragraph of the text in one sentence.
VII. Summarize the text and be ready to retell it.
VIII. Tell us about the advantages and disadvantages of using wireless communications.

UNIT 4.

TELEGRAPH

I. Consider the following questions in the group of four. A spokesperson will report on your discussion to the whole group.

1. Why is telegraph still popular now?
2. Are there any private wire systems in Belarus?
3. What can you say about modern telegraph services in our country?

II. Read the text below and check its comprehension.

Telegraph

1. Introduction

Telegraph is a system of communication employing electrical apparatus *to transmit* and receive signals in accordance with a code of electrical pulses. Originally the term *telegraphy* referred to any form of *communication* over long distances in which *messages* were *transmitted* by signs or sounds.

2. The Morse Telegraph

The first electrical instruments for telegraphic transmission were invented in the United States by the American inventor Samuel F. B. Morse in 1837 and in Britain the same year by the British physicist Sir Charles Wheatstone in collaboration with the British engineer Sir William F. Cooke. Morse used a simple code in which messages were transmitted by electric pulses passing over a single wire. Morse's apparatus, which sent the first public telegram in 1844, resembled a simple electric switch. It allowed current to pass for a prescribed length of time and then shut it off, all at the pressure of a finger. The original Morse receiver had an electro-magnetically controlled pencil that made marks on paper tape moving over a clockwork-operated cylinder. The marks varied with the duration of the electric current passing through the wires of the electric magnet and took the written form of dots and dashes.

While experimenting with his instrument, Morse found that signals could be transmitted successfully for only about 32 km (20 mi). Beyond that distance the signals grew too weak to be recorded. Morse and his associates therefore developed a relay apparatus that could be attached to the telegraph line 32 km from the signal station to repeat signals automatically and send them an additional 32 km. The relay consisted of a switch operated by an electromagnet. An impulse entering the coil of the magnet caused an armature to rotate and close an independent circuit actuated by a battery. This action sent a fresh pulse of current into the line, and this pulse in turn activated successive relays until the receiver was reached. A few years after Morse developed his receiving instrument and demonstrated it successfully, telegraph operators discovered that it was possible to distinguish dots and dashes by sound alone, and the Morse recording apparatus was therefore discarded.

Because telegraphy was too expensive for widespread use, several means of sending some messages simultaneously over a single line were developed. In duplex telegraphy, the earliest advance of this kind, one message can be transmitted simultaneously in each direction between two stations. In quadruplex telegraphy, invented in 1874 by the American engineer Thomas Edison, two messages were transmitted in each direction simultaneously. In 1915 multiplex telegraphy came into use, permitting the transmission of eight or more messages simultaneously. Because of this and the development of teleprinting machines during the mid-1920s, the Morse manual telegraph system of code and key was gradually discontinued for commercial use and replaced by automatic wire and wireless radio-wave methods of transmission.

3. Automatic Telegraph Systems

There are two basic systems of modern *telegraphic communication*: the teleprinting system (teletype), which is still in use, and the facsimile reproduction system, which became obsolete in the 1980s.

A. *Teleprinting*

In teleprinting, the message is received in the form of typed words on a paper form. In this system each letter of the alphabet is represented by one of 31 combinations of five equal-interval electronic impulses, with the sequence of used and unused intervals determining the letter. The start-stop printing code uses seven pulses for each character, the first pulse indicating the beginning and the seventh pulse the end of the letter.

The transmitter or teletypewriter consists of a typewriter like keyboard and may or may not record the message on tape before it is transmitted. The receiver is basically like a typewriter without a keyboard that prints the message on a tape or a paper form. Most machines in the start-stop system are both *transmitters* and *receivers*. News organizations were among the major users of the teletype and similar communications systems. By the early 1990s, however, press associations and broadcast media transmitted both text and pictures electronically via satellite.

B. Facsimile Reproduction

Facsimile telegraph systems, which send and receive images and text, have been rendered largely obsolete by facsimile transmission, commonly referred to as *fax.*

4. Telegraph Carrier Media

The electrical impulses that make up telegraph messages may be carried through wire circuits or may be broadcast as radio waves.

When Morse invented the telegraph, the only way that a message could be carried from one point to another was by wires strung directly from the transmitting device to the receiver, regardless of the distance. The wire could carry only one message at a time, and reamplification and signal correction devices had to be set up

at regular points along the line. By utilizing carrier currents, which are alternating currents of a number of different frequencies, a single pair of wires can simultaneously transmit hundreds of messages, for each frequency represents a transmission channel. The various channels are combined at the sending station into the carrier current transmitted by the telegraph wires. At the receiving end the carrier current is passed through electrical filters, each of which transmits only a particular frequency to an appropriate receiving device. Thus, a great number of individual channels may be obtained with only one electrical circuit.

5. Microwave Transmission

The use of microwave radio transmission for long-distance telegraphic communication all over the world grew to be of major importance after World War II ended in 1945. The first commercial microwave radio link in telegraphy began operation between Philadelphia and New York City in 1947. It was followed in 1948 by a three-way network linking New York City, Washington, D.C., and Pittsburgh. The system then spread rapidly across the United States through the use of microwave relay antenna towers.

Microwave telegraphy is capable of carrying vocal, printed, graphic, photographic, and video communication almost instantaneously and in large quantities. It operates in the 4000-megahertz range of the commercial communications band. In this range, 40 voice bands are available in either direction, providing about 800 telegraph channels. The radio signals originating at the broadcast source are relayed to their destination by a series of parabolic reflector antennas mounted at the top of tall masts. In order to overcome weakening of the signal by distance and the curvature of the earth, these microwave relay antennas are placed at line-of-sight intervals about 48 km (about 30 mi) apart. For intercontinental communication, artificial geosynchronous satellites are used as relay antennas for voice, data, graphic, and video signals between ground-based stations.

6. Modern Telegraph Services

In the 1950s and 1960s a variety of public and private telegraphic services became available from various carriers.

A. *Telex*

In 1958 a system of direct-dial teleprinter exchange, called Telex, was introduced, and within ten years it had more than 25,000 subscribers. The Telex system enabled subscribers to send messages and data directly to other subscribers in North America and, through the facilities of international carriers, in many other parts of the world. In some areas Telex subscribers could also send messages to non-subscribers by dialing special communications centers that delivered the messages as telegrams.

B. ***Broadband Exchange Service***

This service, introduced in 1964, provided subscribers with a choice of high-quality radio channels for the rapid transmission of data in various forms, for facsimile and other record communications, and for voice communication. Improvements to the system made it possible to achieve high-speed transmission—up to 5000 characters per second—between computers and business machines.

C. Private Wire Systems

These services, used for high-speed exchange of data, are leased by businesses or government agencies that have branches in many parts of the world. They operate through digital computer centers by means of punched cards, perforated tape, and magnetic tape. The largest and most advanced of these systems is the Automatic Digital Data Network (AUTODIN), which serves the U.S. Department of Defense. The Advanced Record System (ARS) serves the General Services Administration of the federal government. Other private wire systems serve large brokerage firms and banks.

D. Computer Centers

In response to the needs of subscribers for a variety of communication and information services, "computer-library" centers have been established to provide exchange of data and collection of information of every possible type. The computer centers are available to subscribers through the Telex system and through normal telephone lines.

Comprehension Check Up

1. Who invented the first electrical instruments for telegraphic transmission?
2. How were messages transmitted? 3. How did the original Morse receiver work?
3. What do you know about duplex, quandruplex and multiplex telegraphy?
4. What are the basic systems of modern telegraphic communication?
5. How may the electrical impulses be carried?
6. When did the commercial microwave radio begin operation in telegraphy?
7. How does microwave telegraphy work?
8. When was microwave transmission established?
9. What can you say about the Telex system?
10. What did Broadband Exchange service provide subscribers with?
11. What were private wire systems used for?
12. Why were computer centers established?

III. Choose the best answer

1. The word *telegraph* refers to …
   a) radio-relay system;
   b) system of communication;
   c) pulse-modulation system;

d) control system.

2. *Duplex telegraphy* implies that…

a) four messages can be transmitted simultaneously in each direction between 2 stations;

b) three messages can be transmitted simultaneously in each direction between 2 stations;

c) two messages can be transmitted simultaneously in each direction between 2 stations;

d) one message can be transmitted simultaneously in each direction between 2 stations.

3. The word *receiver* defines …

a) equipment that converts signals;

b) equipment that receives signals;

c) equipment that creates signals;

d) equipment that generates and sends electro-magnetic impulses.

4. *To transmit messages* implies that one should …

a) send information to smb.;

b) deliver messages;

c) send a letter to smb.;

d) dial smb.'s number.

5. *Telegraphic communication* consists of …

a) two basic systems: the teleprinting system (teletype) and the facsimile;

b) teletypewriter switching system;

c) television relay system;

d) time-division multiplex system.

6. The word *transmitter* refers to …

a) equipment that transforms signals;

b) equipment that reflects signals;

c) equipment that sends out signals;

d) equipment that modulates signals.

7. The word *communication* means …

a) the process by which people exchange information;

b) data collection;

c) the process of making a telephone call;

d) the process of mastering new technologies.

8. The best explanation of *Telex* might be …

a) a triplex system;

b) a system of sending messages from one place to another;

c) a system of direct-dial teleprinter exchange;

d) an optical communication system.

9. *Microwave telegraphy* deals with…

a) scanning process;

b) carrying vocal, printed, graphic, photographic and video communication almost instantaneously;

c) developing process;
d) lithography process.

10. The best explanation of the *Broadband Exchange Service* might be

a) service which provides subscribers with a choice of high-quality radio channels for the rapid transmission of data in various forms;
b) long distance service;
c) broadcasting service;
d) public radio communication system.

11. The word *teleprinting* means that …

a) the message is received in the form of symbols;
b) the message is received in the form of codes;
c) the message is received in the form of typed words on a paper form;
d) the message is received in the form of digits.

12. The best definition of the *Facsimile telegraph systems* might be …

a) systems which disseminate information from public information supplies into home or office;
b) paging systems;
c) systems which display still frames of information from a remote data base on a home TV set screen;
d) systems which send and receive images and texts.

IV. *Use the right verb from those given below:*

to lease, to send, to deliver, to relay, to operate, to make up, to receive, to print, to record, to set up, to mount

1. In teleprinting the message is … in the form of typed words on a paper form.
2. The teleprinter may … the message on tape.
3. The receiver is basically a typewriter without a keyboard that … the message on a tape or a paper form.
4. Signal correction devices had to be … at regular points along the line.
5. Facsimile telegraph systems … and … images and text.
6. The electrical impulses … telegraph messages.
7. Microwave telegraphy … in the 4000 – megahertz range of the commercial communication band.
8. The radio signals are … to their destination by parabolic reflector antennas.
9. Parabolic reflector antennas are … at the top of tall masts.
10. In some areas Telex subscribers … messages to non-subscribers by dialing special communication centers that … the messages as telegrams.
11. Private wire systems are … by business agencies that have branches in many parts of the world.

V. Are the following statements True of False?
1. The first electrical instruments for telegraphic transmission were invented in Russia.
2. Morse's apparatus, which sent the first public telegram in 1844, resembled a simple electric switch.
3. In quadruplex telegraphy, invented in 1874 by the American engineer Thomas Edison, four messages were transmitted in each direction simultaneously.
4 The first commercial microwave radio link in telegraphy began operation between Philadelphia and New York City in 1947.
5. In 1958 a system of direct dial teleprinter exchange, called Telex, was introduced.

VI. Express the main idea of each part/paragraph of the text in one sentence.
VII. Summarize the text and be ready to retell it.
VIII. Tell us about the advantages and disadvantages of using telegraph.

UNIT 5.

TELEPHONE

I. Consider the following question in the group of four. A spokesperson will report on your discussion to the whole group.
1. Do all the families in Belarus have telephones?
2. What are telephones used for?
3. Who do you usually phone and why?
4. What number will you dial for fire brigade or for ambulance in Belarus (Great Britain, the USA)?
5. What telephone would you like to have?
6. Why do you think telephones are still popular with many people?

II. Read the text below and answer the questions.

Telephone

Telephone is an instrument that sends and receives voice messages and data. Telephones *convert* speech and *data* to electrical energy, which is sent over great distances. All telephones are *linked* by complex switching systems called central offices or *exchanges*, which *establish* the pathway for information to travel.

1. Parts of a Telephone

A basic telephone set *contains* a *transmitter* that transfers the caller's voice; a receiver that amplifies sound from an incoming call; a rotary or push-button *dial*; a ringer or alerter; and a small assembly of electrical parts, called the antisidetone *network*, that keeps the caller's voice from sounding too loud through the receiver. If it is a two-piece telephone set, the transmitter and receiver are *mounted* in the handset, the ringer is typically in the base, and the dial may be in either the base or

handset. The handset cord connects the base to the handset, and the line cord connects the telephone to the telephone line.

More *sophisticated* telephones may vary from this pattern. A speakerphone has a microphone and speaker in the base in addition to the transmitter and receiver in the handset. Speakerphones allow callers' hands to be free, and allow more than two people to listen and speak during a call. In a *cordless phone*, the handset cord is *replaced* by a radio link between the handset and base, but a line cord is still used. This *allows* a caller to move about in a limited area while on the telephone. A cellular phone has extremely miniaturized components that make it possible to combine the base and handset into one handheld unit. No line or handset cords are needed with a cellular phone. A cellular phone permits more mobility than a cordless phone.

A. Transmitter

There are two common kinds of telephone transmitters: the carbon transmitter and the electret transmitter. The carbon transmitter is constructed by placing carbon granules between metal plates called electrodes. One of the metal plates is a thin diaphragm that takes variations in pressure caused by sound waves and transmits these variations to the carbon granules. The electrodes conduct electricity that flows through the carbon. Variations in pressure caused by sound waves hitting the diaphragm *cause* the electrical resistance of the carbon to vary—when the grains are squeezed together, they conduct electricity more easily; and when they are far apart, they conduct electricity less efficiently. The resultant current *varies* with the sound-wave pressure applied to the transmitter.

The electret transmitter is composed of a thin disk of *metal-coated plastic* and a thicker, hollow metal disk. In the handset, the plastic disk is held slightly above most of the metal disk. The plastic disk is electrically charged, and an electric field is created in the space where the disks do not touch. Sound waves from the caller's voice cause the plastic disk to vibrate, which changes the distance between the disks, and so changes the intensity of the electric field between them. The variations in the electric field are translated into variations of electric current, which travels across telephone lines. An amplifier using transistors is needed with an electret transmitter to obtain sufficiently strong variations of electric current.

B. Receiver

The receiver of a telephone set is made from a *flat ring* of magnetic material with a short cuff of the same material attached to the ring's outer rim. Underneath the magnetic ring and inside the magnetic cuff is a coil of wire through which electric current, representing the sounds from the distant telephone, flows. A thin diaphragm of magnetic material is suspended from the inside edges of the magnetic ring so it is positioned between the magnet and the coil. The magnetic field created by the magnet changes with the current in the coil and makes the diaphragm vibrate. The vibrating diaphragm creates sound waves that replicate the sounds that were transformed into electricity by the other person's transmitter.

C. Alerter

The alerter in a telephone is usually called the ringer, because for most of the telephone's history, a bell was used to indicate a call. The alerter *responds* only to a special frequency of electricity that is sent by the exchange in response to the request for that telephone number**.**

D. Dial

The telephone dial has undergone major changes in its history. Two forms of dialing still exist within the telephone system: dial pulse from a rotary dial, and multifrequency tone, which is commonly called by its original trade name of Touch-Tone, from a push-button dial.

In a rotary dial, the numerals one to nine, followed by zero, are placed in a circle behind round holes in a movable plate. The user places a finger in the hole *corresponding* to the desired digit and *rotates* the movable plate *clockwise* until the user's finger hits the finger stop; then the user removes the finger. A spring mechanism causes the plate to *return* to its starting position, and, while the plate is turning, the mechanism opens an electrical switch the number of times equal to the dial digit. Zero receives ten switch openings since it is the last digit on the dial. The result is a number of "dial pulses" in the electrical current flowing between the telephone set and the exchange. Equipment at the exchange counts these pulses to *determine* the number being called.

The rotary dial has been used since the 1920s. But mechanical dials are expensive to *repair* and the rotary-dialing process itself is slow, especially if a long string of digits is dialed. The development of inexpensive and reliable amplification *provided* by the introduction of the transistor in the 1960s made practical the design of a dialing system based on the transmission of relatively low power tones instead of the higher-power dial pulses.

Today most telephones have push buttons instead of a rotary dial. Touch-Tone is an *optional service*, and telephone companies still *maintain* the ability to receive pulse dialing. Push-button telephones usually have a switch on the base that the customer can set to determine whether the telephone will send pulses or tones.

Comprehension Check Up

1. What do we call an instrument for sending and receiving voice messages and data?
2. What parts does a basic telephone consist of?
3. Where are the transmitter and receirer placed?
4. What are the advantages of speakerphones compared with other Kinds of phone?
5. Which of the phones permits more mobility, a cellutar phone or a cordless one?
6. What substance is placed between electrodes in the carbon transmitter?
7. What makes the electrical resistance of the carbon in the carbon transmitter vary?
8. What are the main parts of the electret transmitter?
9. Why does on electret transmitter contain an amplifier using transistors?
10. What does the receirer of a telephone contain?
11. What dials are used nowadays?

12. What are the disadvantages of the rotary dial?
13. Why does push – button telephones have a switch on the base?

III. Choose the best answer

1. The best explanation of the expression *to convert data* might be…
    a) to obtain facts;
    b) to arrange meeting at a certain time;
    c) to change information from one form into another;
    d) to delete information.
2. The word *exchange* refers to …
    a) a control office where telephone lines are connected;
    b) a special-purpose telephone;
    c) money;
    d) movement from one place to another.
3. The word *transmitter* means…
    a) a person who delivers messages;
    b) an apparatus for sending out signals, messages;
    c) a part of a telephone that you hold near to your ear;
    d) means of convegance.
4. The word *dial* implies…
    a) a code of number for a telephone exchange;
    b) a part of a telephone with numbers used to make a connection;
    c) apparatus used to give a warning signal;
    d) a telephone conversation.
5. The word *network* means…
    a) material made by knotting a string;
    b) hard work;
    c) defensire structures;
    d) a connected system.
6. The verb *to mount* measns…
    a) to separate;
    b) to create;
    c) to put and fix;
    d) to make better.
7. The word *sophisticated* means…
    a) large;
    b) complex;
    c) having a deep sound;
    d) multi-channel.
8. The expression *cordless phone* refers to …
    a) the phone in which the handset is connected with the base by the handset cord;
    b) the phone in which there are no lines or handset cords;
    c) the phone in which there is a radio link between the handset and base;

d) a speakerphone

9. The verb *to cause* can be paraphrazed as …
   a) to change;
   b) to pay attention;
   c) to suggest;
   d) to make happen.
10. The *metal-coated plastic* implies
   a) metal which is coated with plastic;
   b) plastic which is covered with metal;
   c) plastic and metal covering;
   d) a layer of plastic put on metal.
11. The best explanation of the *flat ring* might be …
   a) a wedding ring;
   b) a circular band worn round a finger;
   c) a smooth and level band;
   d) a ring which is kept in a flat.
12. The verb to *replicate* means…
   a) to repeat;
   b) remove;
   c) readdress;
   d) rewrite.
13. The best explanation of the word *clockwise* might be…
   a) the instrument for measuring and showing the time;
   b) moving in the same direction as the hands of a clock;
   c) moving in the direction opposite to that taken by the hands of a clock;
   d) the clock showing the right time.
14. *Optional service* means
   a) compulsory service;
   b) help or advice given by manufactacturers;
   c) the service which may be chosen or not as one wishes;
   d) absent-subscriber service.

IV. Use the right verb from those given below:

to establish, to provide, to replace, to rotate, to vary, to link, to correspond, to determine, to contain, to allow, to return, to maintain, to repair, to respond

1.Telephone exchanges … all telephones and …the pathway for information to travel.
2. “Dial pulses” are counted at the exchange … the number being called.
3. Transistor … the development of inexpensive and reliable amplification.
4. A basic telephone set … a receiver, a transmitter, a dial, a ringer, and a small assembly of electrical parts.
5. In a cordless phone, radio link … the handset cord.

6. Radio link between the handset and base … a caller to move about while on the phone.
7. Making a call one should place a finger in the hole which … to the desired digit and … the movable plate clockwise.
8. Then the plate … to its starting position.
9. The ability to receive pulse dialing still … by telephone companies.
10. It's rather expensive … mechanical dials.
11. The resultant current …with the soundwave pressure applied to the transmitter.
12. The ringer … only to a shecial frequency of electricity.

V. Are the following stat emens True or False?
1. In a two-piece telephone set, the transmitter and receiver are placed in the handset, the ringer is usually in the base.
2. The electrical transmitter consists of a thin disk, thick and hollow metal base.
3. A device designed for amplification of sound from an incoming call is called a receiver.
4. The telephone dial hasn't changed since its invention.
5. In a rotary dial zero follows the numberals one to nine.

VI. Divide the text into paragraphs.
VII. Express the main idea of each paragraph in one sentence.
VIII. Summarize the text and be ready to retell it.
IX. Speak on the advantage.

UNIT 6.

MAKING A TELEPHONE CALL

I. Consider the following questions in the group of four. A spokesperson will report on your discussion to the whole group.
1. Do your know how to make a telephone call? Describe your actions, please.
2. Are there any telephone subscribers served by manual exchanges in your town?
3. Why do you think that to make a call to London, is as easy as to the next door nowadays?
4. What kind of telephone do you consider the most convenient?

II. Read the text below and check its comprehension.

Making a Telephone Call

A telephone call starts when the caller lifts a handset off the base. This closes an electrical switch that initiates the flow of a steady electric current over the line between the user's location and the *exchange*. The exchange detects the current and returns a *dial tone*, a precise combination of two notes that lets a caller know the line is ready.

Once the dial tone is heard, the caller uses a rotary or push-button dial mounted either on the handset or base to enter a sequence of digits, the telephone number of the called party. The switching equipment in the exchange removes the dial tone from the line after the first digit is received and, after receiving the last digit, determines whether the called party is in the same exchange or a different exchange. If the called party is in the same exchange, bursts of ringing current are applied to the called party's line. Each telephone contains a *ringer* that responds to a specific electric frequency. When the called party answers the telephone by picking up the handset, *steady* current starts to flow in the called party's line and is detected by the exchange. The exchange then stops applying ringing and sets up a connection between the caller and the called party.

If the called party is in a different exchange from the caller, the caller's exchange sets up a connection over the telephone network to the called party's exchange. The called exchange then *handles* the process of ringing, detecting an answer, and *notifying* the calling exchange and *billing machinery* when the call is completed.

When the conversation is over, one or both parties hang up by replacing their handset on the base, stopping the flow of current. The exchange then initiates the process of taking down the connection, including notifying billing equipment of the *duration* of the call if appropriate. Billing equipment may or may not be involved because calls within the local calling area may be either *flat rate* or *message rate*. In flat-rate service, the *subscriber* is allowed an unlimited number of calls for a fixed fee each month. For message-rate subscribers, each call involves a charge that depends on the distance between the calling and called parties and the duration of the call. A long-distance call is a call out of the local calling area and is always billed as a message-rate call.

A. Switching

Telephone switching equipment interprets the number dialed and then completes a path through the network to the called subscriber. For long-distance calls with complicated paths through the network, several levels of switching equipment may be needed. The *automatic exchange* to which the subscriber's telephone is connected is the lowest level of switching equipment and is called by various names, including local exchange, local office, central-office switch, or, simply, *switch*. Higher levels of switching equipment include tandem and toll switches, and are not needed when both caller and called subscribers are within the same local exchange.

Today in the United States all telephone subscribers are served by automatic exchanges. The number being dialed is stored and then passed to the exchange's central computer, which in turn operates the switch to complete the call or routes it to a higher-level switch for further processing.

Today's automatic exchanges use a pair of computers, one running the program that provides service, and the second monitoring the operation of the first, ready to take over in a few seconds in the event of an equipment failure.

The greatly expanded information-processing capability of modern computers permits Direct Distance Dialing, with which a subscriber can automatically place a call to a distant city without needing the services of a human operator to determine the appropriate *routing* path through the network. Computers in the switching machines used for long-distance calls store the routing information in their electronic memory. A toll-switching machine may store several different possible routes for a call. As telephone traffic becomes heavier during the day, some routes may become unavailable. The toll switch will then select a less direct alternate route to permit the completion of the call.

B. Transmission

Calling from New York City to Hong Kong involves using a path that transmits electrical energy halfway around the world. During the conversation, it is the task of the transmission system to *deliver* that energy so that the speech or data is transmitted clearly and free from noise. Since the telephone in New York City does not know whether it is connected to a telephone next door or to one in Hong Kong, the amount of energy put on the line is not different in either case. However, it requires much more energy to converse with Hong Kong than with next door because energy is lost in the transmission. The transmission path must provide amplification of the signal as well as transport.

Analog transmission, in which speech or data is converted directly into a varying electrical current, is suitable for local calls. For long-distance calls, the signal is digitized, or converted to a series of pulses that encodes the information.

Digital transmission systems are much less subject to interfering noise than are analog systems. The digitized signal can then be passed through a digital-to-analog converter (DAC) at a point close to the receiving party, and converted to a form that the ear cannot *distinguish* from the original signal.

There are several ways a digital or analog signal may be transmitted, including *coaxial* and *fiber-optic cables* and microwave and longwave radio signals sent along the ground or bounced off *satellites* in orbit around the earth.

A coaxial wire is an efficient transmission system. A coaxial wire has a conducting tube surrounding another conductor. A coaxial cable contains several coaxial wires in a common outer covering. The important *benefit* of a coaxial cable over a cable composed of simple wires is that the coaxial cable is more efficient at carrying very high frequency currents. This is important because in providing transmission over long distances. The combined signal containing hundreds of individual telephone conversations is sent over one pair of wires in a coaxial cable, so the signal has to be very clear. Coaxial cable is expensive to install and maintain, especially when it is lying on the ocean floor.

Another telephone-transmission method uses fiber-optic cable, which is made of bundles of optical fibers, long *strands* of specially made glass encased in a protective coating. Optical fibers transmit energy in the form of light pulses. The technology is similar to that of the coaxial cable, except that the optical fibers can handle tens of thousands of conversations simultaneously.

Another approach to long-distance transmission is the use of radio. Microwave radio uses very high frequency radio waves and has the ability to handle a large number of simultaneous conversations over the same microwave link. Because cable does not have to be installed between microwave towers, this system is usually cheaper than coaxial cable. On land, the coaxial-cable systems are often *supplemented* with microwave-radio systems.

The technology of microwave radio is carried one step further by the use of communications satellites. Most communications satellites are in geosynchronous orbit that is, they orbit the earth once a day over the equator, so the satellite is always above the same place on the earth's surface. Even considering the expense of a satellite, this method is cheaper to install and maintain per channel than using coaxial cables on the ocean floor. Consequently, satellite links are used regularly in long-distance calling. But satellite communication does have one serious *shortcoming*: Because of the satellite's distance from the earth, there is a noticeable *lag* in conversational responses. As a result, many calls use a satellite for only one direction of transmission, such as from the caller to the receiver, and use a ground microwave or coaxial link for receiver-to-caller transmission.

A combination of microwave, coaxial-cable, optical-fiber, and satellite paths now link the major cities of the world. The capacity of each type of system depends on its age and the territory covered, but capacities generally fall into the following ranges: Frequency modulation over a simple pair of wires like the earliest telephone lines yields tens of circuits per pair; coaxial cable yields hundreds of circuits per pair of conductors, and thousands per cable; microwave and satellite transmissions yield thousands of circuits per link; and optical fiber has the potential for tens of thousands of circuits per fiber.

Comprehension Check Up

1. How does a telephone call start?
2. What lets the caller know the line is ready?
3. How does the switching equipment determine whether the called party is in the same exchange or different exchange?
4. What is the difference between flat rate and message rate?
5. What is the lowest level of switching equipment?
6. Who operates the automatic exchanges?
7. What kinds of transmission systems do you know?
8. What are the ways of telephone transmission?
9. What are the differences between a coaxial cable and fiber-optic cable?
10. What are the advantages of the use of radio?
11. Does satellite communication have any serious shortcomings?
12. What does the capacity of each type of system depend on?

III. Choose the best answer.

1. The expression *telephone exchange* means …

a) a telephone number;

b) a calling area;
c) a switching centre;
d) an electrical switch.

2. *Billing machinery* refers to a machine
a) counting the amount of money you have to pay;
b) sending radio signals;
c) counting the amount of money you have to be paid;
d) counting your telephone calls.

3) The verb *to handle* means…
a) to manage;
b) to remove;
c) to process;
d) to determine.

4. The best explanation of the expression *analog transmission* might be…
a) a system in which each sample is converted into a binary form;
b) a system which controls telephone exchanges;
c) a system which amplifies radio signals;
d) a system in which a varying electrical current transmits the caller's voice pattern.

5. The verb *to deliver* means…
a) to say something to someone;
b) to give smth. to someone;
c) to decide to do something;
d) to call someone.

6. *Fiber-optic cable* refers to long strands
a) of specially made wood, encased in protective coating;
b) of specially made glass encased in a protective coating;
c) of specially made wires encased in a protective coating;
d) of specially made wool encased in a protective coating.

7. The word "*steady"* means …
a) stable;
b) startling;
c)standard;
d) straight.

8. The word *to notify* implies…
a) to give good results;
b) to give advice;
c) to give explanation;
d) to give notice.

9. The best explanation of the *coaxial cable* might be…
a) a cable consisting of long strands of specially made glass encased in a protective coating;
b)a cable consisting of a number of tubes each with a central copper wire and a shield;

c) a link between two or more communication points;
d) an exchange which uses microchip technology.

10. The verb *to distinguish* means …
a) to understand clearly;
b) to perceive clearly;
c) to answer correctly;
d) to supplement with smth.

11. The term *automatic exchange* refers to a system in which
a) a small light of a switchboard alters an operator that a subscriber wants a service;
b) sounds are transmitted over considerable distance;
c) electricity from the battery flows through the wire and causes the buzzer to make a noise;
d)the operations are performed by electrically controlled devices without any intervention of operators.

12. *The flat-rate service* suggests that …
a) each call involves a charge that depends on the distance between the calling and called parties;
b) the subscriber is allowed an unlimited number of calls for a fixed fee each mouth;
c) each call involves a charge that depends on the duration of the call;
d) the subscriber must pay for each call every day.

IV. Use the right noun from those given below:

switch; satellites; strands; exchange; benefit; tone; subscriber; lag; duration; shortcoming; ringer; routes

1. The automatic … is called by various names.
2. Once the dial … is heard, the caller dials the telephone number of the called party.
3. Each telephone contains a … that responds to a specific electric frequency.
4. A message-rate call involves a charge that depends on the distance and the … of the call.
5. In the local network, each … is connected to a local exchange.
6. The automatic exchange is simply called … .
7. A toll-switching machine may store several different possible … for a call.
8. For long distance communication … a very important.
9. The important … of a coaxial cable is that it is efficient at carrying very high frequency currents.
10 Fiber-optic cable is made of long … of specially made glass encased in a protective coating.
11. As you know, satellite communication has one serious … .
12. Because of a noticeable … in conversational responses, many calls use a satellite for only one direction of transmission.

V. Are the following statements True or False?
1. When the caller lifts a handset off the base, a steady electrical current starts to flow over the line between the user's location and the exchange.
2. When the called party answers the telephone, by picking up the handset, the flow of current stops.
3. In flat-range service, each call involves a charge.
4. The automatic exchange is the lowest level of switching equipment.
5. Today all telephone subscribers are served by manual exhanges.
6. A long-distance call requires much more energy because enerdy is lost in the transmission.
7. Analog transmission, in which the signal is converted in series of pulses, is suitable for local calls.
8. A digital and analog signal may be transmitted in several ways.
9. A coaxial cable is more efficient than a cable composed of simple wires.
10. Coaxial cable is easy and cheap to install and maintain.
11. The optical fibers can handle hundreds of conversations simultaneously.
12. A combination of all ways of telephone transmission now links the major cities of the world.

VI. Express the main idea of each paragraph in one sentence.
VII. Summarize the text and be ready to retell it.
VIII. Tell us about the advantages of using an automatic exchange.

UNIT 7.

NETWORK

I. Consider the following questions in the group of four. A spokesperson will report on your discussion to the whole group
1. What do you know about network connections?
2. What was network created for?
3. What do you know about the advances in wireless networks?
4. What type of network connection is used in your town?

II. Read the text below and answer the questions

Network

1. Introduction

A network, in computer science, techniques, physical connections, and computer, and other resources; send electronic messages; and run programs on other computers programs is used to link two or more computers. Network users are able to share files, printers.

A *network* has three layers of components: application software, network software, and network hardware. Application software consists of computer programs that interface with network users and permit the sharing of information, such as files, graphics, and video, and resources, such as printers and disks. One type of application software is called client-server. Client computers send requests for information or requests to use resources to other computers, called servers that control data and applications. Another type of application software is called peer-to-peer. In a *peer-to-peer network*, computers send messages and requests directly to one another without a server intermediary.

Network software consists of computer programs that establish protocols, or rules, for computers to talk to one another. These protocols are carried out by sending and receiving formatted instructions of data called *packets.* Protocols make logical connections between network applications, direct the movement of packets through the physical network, and minimize the possibility of collisions between packets sent at the same time.

Network hardware is made up of the physical components that connect computers. Two important components are the transmission media that carry the computer's signals, typically on wires or fiber-optic cables, and the network adapter, which accesses the physical media that link computers, receives packets from network software, and transmits instructions and requests to other computers. Transmitted information is in the form of binary digits, or bits (1s and 0s) which the computer's electronic circuitry can process.

2. Network Connections

A network has two types of connections: physical connections that let computers directly transmit and receive signals and logical, or virtual, connections that allow computer applications, such as word processors, to exchange information. Physical connections are defined by the medium used to carry the signal, the geometric arrangement of the computers (topology), and the method used to share information. Logical connections are created by network protocols and allow data sharing between applications on different types of computers, such as an Apple Macintosh and an International Business Machines Corporation (IBM) personal computer (PC), in a network. Some logical connections use client-server application software and are primarily for file and printer sharing. The Transmission Control Protocol/Internet Protocol (TCP/IP) suite, originally developed by the United States Department of Defense, is the set of logical connections used by the Internet, the worldwide consortium of computer networks. TCP/IP, based on peer-to-peer application software, creates a connection between any two computers.

A. Media

The medium used to transmit information limits the speed of the network, the effective distance between computers, and the network topology. Copper wires and coaxial cable *provide* transmission speeds of a few thousand bits per second for long distances and about 100 million bits per second (Mbps) for short distances. Optical

fibers carry 100 million to 1 billion bits of information per second over long distances.

B. Topology

Common topologies used to arrange computers in a network are point-to-point, bus, star, and ring. Point-to-point topology is the simplest, consisting of two connected computers. The bus topology is composed of a single link *connected* to many computers. All computers on this common connection receive all signals transmitted by any attached computer. The star topology connects many computers to a common hub computer. This hub can be passive, repeating any input to all computers similar to the bus topology, or it can be active, selectively switching inputs to specific destination computers. The ring topology uses multiple links to form a circle of computers. Each link carries information in one direction. Information moves around the ring in sequence from its source to its destination.

Local area networks (LANs), which connect computers separated by short distances, such as in an office or a university campus, commonly use bus, star, or ring topologies. Wide area networks (WANs), which connect distant equipment across the country or internationally, often use special leased telephone lines as *point-to-point links.*

C. *Sharing Information*

When computers share physical connections to transmit information packets, a set of Media Access Control (MAC) protocols are used to allow information to flow smoothly through the network. An efficient MAC protocol ensures that the transmission medium is not idle if computers have information to transmit. It also prevents collisions due to simultaneous transmission that would waste media capacity. MAC protocols also allow different computers fair access to the medium.

One type of MAC is Ethernet, which is used by bus or star network topologies. An Ethernet-linked computer first checks if the shared medium is in use. If not, the computer transmits. Since two computers can both sense an idle medium and send packets at the same time, transmitting computers continue to monitor the shared connection and stop transmitting information if a collision occurs. Ethernet can transmit information at a rate of 10 Mbps.

Computers also can use Token Ring MAC protocols, which pass a special message called a *token* through the network. This token gives the computer permission to send a packet of information through the network. If a computer receives the token, it sends a packet, or, if it has no packet to send, it passes the token to the next computer. Since there is only one token in the network, only one computer can transmit information at a time.

3. Network Operation and Management

Network management and system administration are critical for a complex system of interconnected computers and resources to *remain* operating. A network manager is the person or team of people responsible for configuring the network so that it *runs* efficiently. For example, the network manager might need to connect

computers that communicate frequently to *reduce* interference with other computers. The system administrator is the person or team of people responsible for configuring the computer and its software to use the network. For example, the system administrator may install network software and configure a server's file system so client computers can access shared *file*s.

Networks are subject to hacking, or illegal access, so shared files and *resources* must be protected. A network intruder could eavesdrop on packets being sent across a network or send fictitious messages. For sensitive information, *data* encryption (scrambling data using mathematical equations) renders captured packets unreadable to an intruder. Most servers also use authentication schemes to ensure that a request to read or write files or to use resources is from a legitimate client and not from an intruder.

4. Future Technologies and Trends

The wide use of notebooks and other portable computers drives advances in wireless networks. Wireless networks use either infrared or radio frequency transmissions to link these mobile computers to networks. Infrared wireless LANs work only within a room, while wireless LANs based on radio-frequency transmissions can *penetrate* most walls. Wireless LANs have *capacities* from less than 1 Mbps to 8 Mbps and operate at distances up to a few hundred meters. Wireless communication for WANS use cellular telephone networks, satellite transmissions, or dedicated equipment to provide regional or global coverage, but they have transmission rates of only 2000 to 19,000 bits per second.

New networks must also meet the growing demand for faster transmission speeds, especially for sound and video applications. One recently developed network, called an Asynchronous Transfer Mode (ATM) network, has speeds of up to 625 Mbps and can be used by either LANs or WANs.

In February 1996 Fujitsu Ltd., Nippon Telephone and Telegraph Corporation, and a team of researchers from AT&T succeeded in transmitting information through an optical fiber at a rate of 1 trillion bits per second—the equivalent of transmitting 300 years of newspapers in a single second. This was accomplished by simultaneously sending different wavelengths of light, each carrying separate information, through the optical fiber. If it can be integrated into a network, this new technology will make it easy, inexpensive, and incredibly fast to send information, such as video and memory-sensitive three-dimensional images.

Comprehension Check Up

1. What is it a network?
2. How many components does the network possess?
3. What do you know about physical and logical or virtual connections? What is the difference between them?
4. What is medium used for?
5. What could you tell me about topology? What topologies are used to arrange computers in a network?

6. When is a set of Media Access Control (MAC) protocols used?
7. At what rate can the information be transmitted by Ethernet?
8. What message is called a token?
9. What is a network manager?
10. How is the problem of illegal access solved?
11. What do you know about wireless networks and how do they operate?
12. What are the main features of wireless networks?
13. At what rate do they operate?
14. What are advantages of applying wireless networks?

III. Choose the best answer.

1. The word *network* means …

a) a communication containing some information sent by radio, telephone or other means;

b) a surface;

c) a boring novel;

d) a media of linking of two or more computers

2. *Peer to peer network* refers to …

a) a message and request sent by computer directly to one another without a sender intermediary;

b) a physical media that links computers;

c) a transmitted information;

d) a bank network

3. The word *packet* means …

a) an electronic message;

b) a type of application;

c) a printer;

d) formatted instructions of data

4. The word *token* deals with …

a) an illegal access;

b) a permission; c) a social activity;

d) a special message

5. The verb *to provide* implies that one should …

a) supply smth.;

b) carry the computer's signal;

c) rely on smb.;

d) take care of smb.

6. *Point – to point links* mean …

a) place on a surface;

b) a material used as a source of heat or power;

c) a village or a small town;

d) special leased telephone line

7. The verb *to remain* implies that one should …
    a) stay in the same place;
    b) continue;
    c) be in the same condition;
    d) linger
8. The verb *to run* refers to …
    a) to manage;
    b) to use;
    c) to operate;
    d) to move
9. The best explanation of the word *file* might be …
    a) any of various types of drawers;
    b) a card index,
    c) an organized collection of related data or material in a computer;
    d) a folder
10. The verb *to connect* means …
    a) to unite;
    b) to put smb. into contact by telephone;
    c) to combine;
    d) to link
11. To *reduce* implies that one should …
    a) make smth. smaller in size, number, etc.;
    b) change smth. to a more regular or basic form;
    c) lessen;
    d) lose weight intentionally
12. The word *resource* means …
    a) a reserve;
    b) a thing that can be turned to for help or support;
    c) a store;
    d) a supply
13. The best explanation of the word *data* might be …
    a) information prepared or stored by a computer;
    b) an evidence;
    c) facts or information used in deciding or discussing smth.;
    d) secret files
14. The verb *to penetrate* implies that one should …
    a) Enter;
    b) fill or spread through smb./smth.;
    c) bore a hole;
    d) make a way into or through smth.
15. The best explanation of the word *capacity* might be …
    a) a volume;
    b) an ability to hold or continue smth.;
    c) a power to produce smth.;

d) a content

IV. Use the right word from those given below:

to connect, hub, collision, to transmit, to link, to process, to run, to penetrate, to install, to meet, to prevent, advance

1. Network in computer science, computer programs used … two or more computers.
2. Transmitted information is the form of binary digits or bits, which the computer's electronic circuitry can ….
3. Physical connections allow computers directly … and receive signals.
4. The star topology … many computers to a common hub computer. 4. Protocols minimize the possibility of … between packets sent at the same time.
5. This … can be passive, repeating any input to all computers similar to the bus topology.
6. A network manager is the person or team of people responsible for configuring the network … efficiently.
7. The system administrator may … network software and configure a server's file system.
8. Wireless LANs based on radio-frequency transmissions can … most walls.
9. New networks must also … the growing demand for faster transmission speeds.
10. It also … collisions due to simultaneous transmission that would waste media capacity. 11. The wide use of portable computers drives … in wireless network.

V. Are the following statements True or False?
1. A network has three layers of components: application software, network software and network hardware.
2. Network hardware is made up of logical components that connect computers.
3. TCP/IP, based on peer-to-peer applications software, creates a connection between any two computers.
4. The ring topology uses a single link to form a circle of computers.
5. One type of MAC is Ethernet, which is used by bus or star network topologies.
6. The network manager might need to connect computers that communicate frequently to increase interference with other computers.
7. Networks are not subjects to illegal access, so shared files shouldn't be protected.
8. The wide use of notebook and other portable computers drives advances in wireless networks.
9. Wireless LANs operate at distances up to a few kilometers. 10. New networks must meet the growing demand for faster transmission speeds.

VI. Express the main idea of each part of the text in one-two sentences.
VII. Summarize the text and be ready to retell it.
VIII. Tell us about the advantages or disadvantages of using networks.

UNIT 8.

INTERNET

I. Consider the following questions in the group of four. A spokesperson will report on your discussion to the whole group.

1. Why do you think the Internet is so popular with many people, especially young people?
2. Do you know how many users of the Internet there are in Minsk and other cities and towns of Belarus?
3. Do you remember when access to the Internet was provided in Belarus?
4. Will the number of users of the Internet be growing in Belarus?

II. Read the text below and check its comprehension.

Internet

1. Introduction

The Internet is a computer-based worldwide information *network*. The Internet is composed of a large number of smaller *interconnected* networks called internets. These internets may connect tens, hundreds, or thousands of computers, enabling them to *share* information with each other and to share various *resources*, such as powerful supercomputers and *databases* of information. The Internet has made it possible for people all over the world to effectively and inexpensively communicate with each other. Unlike traditional broadcasting media, such as radio and television, the Internet is a decentralized system. Each connected individual can communicate with anyone else on the Internet, can publish ideas, and can sell products with a minimum overhead cost. In the future, the Internet may have a dramatic impact on higher education and business as more universities offer courses and more companies offer goods and services *online*.

2. Uses of the Internet

Individuals, companies, and institutions use the Internet in many ways. Businesses use the Internet to *provide access* to complex databases, such as financial databases. Companies can carry out commerce online, including advertising, selling, buying, distributing products and providing after-sales services. Businesses and institutions can use the Internet for voice and video conferencing and other forms of communication that allow people to telecommute, or work from a distance. The use of *electronic mail* over the Internet has greatly speeded communication between companies, among coworkers, and between other individuals. Media and entertainment companies use the Internet to broadcast audio and video, including live radio and television programs; to offer online chat, in which people carry on discussions using written text; and to offer online news and weather programs. Scientists and scholars use the Internet to communicate with colleagues, to perform research, to distribute lecture notes and course materials to students, and to publish

papers and articles. Individuals use the Internet for communication, entertainment, finding information, and to buy and sell goods and services.

3. How the Internet Works

The Internet is based on the concept of a *client-server relationship* between computers, also called a *client /server architecture*. In a client/server architecture, some computers act as servers, or information providers, while other computers act as clients, or information receivers. The client/server architecture is not one-to-one—that is, a single *client computer* may access many different servers, and a single server may be accessed by a number of different client computers. Prior to the mid-1990s, servers were usually very powerful computers such as mainframes or supercomputers, with extremely high processing speeds and large amounts of memory. Personal computers and workstations, however, are now capable of acting as Internet servers due to advances in computing technology. A *client computer* is any computer that receives information from a server and is often a personal computer.

To access information on the Internet, a user must first *log on*, or connect, to the client computer's host network. A *host network* is a network that the client computer is part of, and is usually a local area network (LAN). Once a connection has been established, the user may *request* information from a remote server. If the information requested by the user *resides* on one of the computers on the host network, that information is quickly *retrieved* and sent to the user's terminal. If the information requested by the user is on a server that does not belong to the host LAN, then the host network connects to other networks until it makes a connection with the network containing the requested server. In the process of connecting to other networks, the host may need to access a *router*, a device that determines the best connection path between networks and helps networks to make connections.

4. The Future of the Internet

A major challenge facing the continued growth of the Internet is the difficulty of providing enough *bandwidth* (the amount of data that a computer network can transmit.) to sustain the network. As Internet applications become more sophisticated, and as more people around the world use the Internet, the amount of information transmitted across the Internet will demand very high bandwidth connections. While many communications companies are attempting to develop higher bandwidth technologies, it is not known whether the technology will be able to satisfactorily keep up with demand.

Another important question facing Internet growth is the issue of censorship. Because the Internet has grown so rapidly, governments have been slow to regulate its use and to pass laws regarding what content is acceptable.

Commercial use of the Internet is sure to grow dramatically as more individuals *gain access* to it. It may be possible in the future to order nearly any goods from Internet sites and have them delivered using the postal service.

The issue of business being conducted over the Internet raises important security issues. Companies doing business over the Internet must have very sophisticated security measures in place so that information such as credit card, bank account, and social security numbers cannot be accessed by unauthorized users. Similarly, government facilities, universities, and institutions must ensure that access to their computers over the Internet is strictly regulated.

Comprehension Check Up

1. What is the Internet?
2. What is it composed of?
3. In what ways is the Internet used?
4. What has the use of electronic e-mail over the Internet speeded?
5. On what concept is the Internet based?
6. What must a user do to access information on the Internet?
7. What is a major demand facing the continued growth of the Internet?
8. What is another important question facing Internet growth?
9. Is commercial use of the Internet sure to grow?

III. Choose the best answer.

1. The word *Internet* refers to …
    a) resources;
    b) a supercomputer;
    c) information network;
    d) database.
2. The word *internets* means …
    a) hundreds of computers;
    b) radio and television;
    c) broadcasting media;
    d) smaller interconnected networks.
3. The best explanation of the concept of a *client-server architecture* might be …
    a) some computers act as information providers, while other computers act as information receivers;
    b) personal computers act as Internet servers;
    c) very powerful computers act as servers;
    d) a single client computer may access many different servers.
4. A *client computer* means …
    a) an information receiver;
    b) an information provider;
    c) a personal computer;
    d) a mainframe.
5. The word *server* implies …
    a) a workstation;
    b) a supercomputer;
    c)an information provider;

d) an information receiver.

6. *To access information* on the Internet implies that one should…
   a) request information from a remote server;
   b) first log on to the client computer's host network;
   c) connect to other networks;
   d) access a router.
7. *To log on to the host network* refers to …
   a) the action of connecting to the client computer's host network;
   b) the process of connecting to a local area network (LAN);
   c) the process of connecting to other networks;
   d) the process of making a connection with a server.
8. A *host network* defines …
   a) a local area network (LAN);
   b) a personal computer network;
   c) a public data network;
   d) a dial-up network.
9. The best explanation of *information retrieval* might be …
   a) information restoration;
   b) data retrieval;
   c) information search;
   d) remote access.
10. The verb *to route* means…
   a) to send by a specific route;
   b) to transmit data;
   c) to arrive at the destination;
   d) to label with a unique number.
11. The word *reside* implies …
   a) to be in an intermediate memory;
   b) to be present in;
   c) to be in a permanent memory;
   d) to be in a user memory.
12. T*o gain access* refers to …
   a) to establish a connection;
   b) to access information;
   c) to be linked to;
   d) to make a connection.
13. The *router* deals with …
   a) supporting easy Internet access;
   b) packaging information;
   c) helping networks to make connections;
   d) determining the best connection path between networks.
14. The word *bandwidth* means …
   a) frequency band;
   b) pass band;

c) the amount of data that a computer network can transmit;
d) communication bandwidth.

IV. *Use the right verb from those given below:*

To communicate, to carry out, to speed, to reside, to provide, to demand, to share, to offer, to use, to request, to retrieve, to grow

1. Computers are able … information with each other.
2. Each connected individual can … with anyone else on the Internet.
3. More universities and companies … courses, goods and services online.
4. Companies can … commerce online, including advertising, selling, buying, distributing products.
5. Businesses and institutions can … the Internet for voice and video conferencing and other forms of communication.
6. The use of electronic mail over the Internet has greatly … communication between companies, among coworkers and between other individuals.
7. The user may … information from a remote server.
8. The information requested by the user … on one of the computers.
9. That information is quickly … and sent to the user's terminal.
10. A major difficulty is … enough bandwidth to sustain the network.
11. As Internet applications become more sophisticated the amount of information transmitted over the Internet will … very high bandwidth connections.
12. Commercial use of the Internet is sure … dramatically as more individuals gain access to it.

V. Are the following statements True or False?
1. Internet is a computer-based worldwide information network.
2. The Internet is composed of a large number of interconnected networks called internets.
3. The Internet is a centralized system.
4. The Internet has made it possible for all people all over the world to effectively and inexpensively communicate with each other.
5. In the future the Internet may have no dramatic impact on higher education and business.
6. Individuals, companies and institutions use the Internet in few ways.
7. Media and entertainment companies don't use the Internet to broadcast audio and video, including live radio and television.
8. Scientists and scholars don't use the Internet to communicate with colleagues, to perform research, to distribute lecture notes and course materials to students, and to publish papers and articles.

VI. Divide the text into paragraphs.
VII. Express the main idea of each paragraph in one sentence.
VIII. Summarize the text and be ready to retell it.
*IX. Speak on pros and cons of the Internet communication***.**

UNIT 9.

E-MAIL

I. Consider the following questions in the group of four. A spokesperson will report on your discussion to the whole group.
1. Have you ever heard about e-mail?
2. Can e-mail messages be sent without a computer?
3. What kind of possibilities does e-mail offer to people in the world?
4. In what fields of man's activities can e-mail be used?
5. What is the difference between the Internet Explorer and an e-mail program?

II. Read the text below and check its comprehension.

E-Mail

E-mail, in computer science, is an abbreviation of the term electronic mail, method of transmitting data or text files from one computer to another over an internet, *intranet*, or the Internet. *E-mail* enables computer users to send messages and data quickly through a local area network or beyond through a nationwide or worldwide communication network. E-mail *came into widespread use* in the 1990s and has become a major development in business and personal communications.

E-mail users create and send messages from individual computers using commercial e-mail programs or *mail-user agents* (MUAs). Most of these programs have a text editor for composing messages. The user sends a message to one or more recipients by specifying destination addresses. When a user sends an e-mail message to several recipients at once, it is sometimes called *broadcasting*.

The address of an e-mail message includes the source and *destination* of the message. Different addressing *conventions* are used depending upon the e-mail destination. An interoffice message distributed over an intranet, or internal computer network, may have a simple scheme, such as the employee's name, for the e-mail address. E-mail messages sent outside of an intranet are addressed according to the following convention: The first part of the address contains the user's name, followed by the symbol @ (pronounced as at or monkey), the *domain* name, the institution's or organization's name, and finally the country name.

A typical e-mail address might be *sally@abc.com*. In this example *sally* is the user's name, *abc* is the domain name—the specific company, organization, or institution that the e-mail message is sent to or from, and the suffix *com* indicates the type of organization that *abc* belongs to—*com* for commercial, *org* for organization, *edu* for educational, *mil* for military, and *gov* for governmental. An e-mail message

that originates outside the United States or is sent from the United States to other countries has a supplementary suffix that indicates the country of origin or destination. Examples include *uk* for the United Kingdom, *fr* for France, and *au* for Australia.

E-mail data travels from the sender's computer to a network tool called a message transfer agent (MTA) that, depending on the address, either delivers the message within that network of computers or sends it to another MTA for distribution over the Internet. The data file is eventually delivered to the private mailbox of the recipient, who *retrieves* and reads it using an e-mail program or MUA. The recipient may *delete* the message, store it, reply to it, or forward it to others.

Modems are important devices that have allowed for the use of e-mail beyond local area networks. Modems *convert* a computer's binary language into an analog signal and transmit the signal over ordinary telephone lines. Modems may be used to send e-mail messages to any destination in the world that has modems and computers able to receive messages.

E-mail messages display technical information called headers and footers above and below the main message body. In part, headers and footers record the sender's and recipient's names and e-mail addresses, the times and dates of message transmission and receipt, and the subject of the message.

In addition to the plain text contained in the body of regular e-mail messages, an increasing number of e-mail programs allow the user to send separate files attached to e-mail transmissions. This allows the user *to append* large text- or graphics-based files to e-mail messages.

E-mail has had a great impact on the amount of information sent worldwide. It has become an important method of transmitting information previously relayed via regular mail, telephone, *courier*, fax, television, and radio. In 1995 alone, e-mail users sent approximately 25 billion messages.

Comprehension Check Up

1. How can a person send messages from one computer to another?
2. How big is the e-mail service area?
3. When did e-mail come into widespread use?
4. What can you say about commercial e-mail programs?
5. Is there a special form for any e-mail address?
6. What is it a modem?
7. What is the role of headers and footers?
8. How many e-mail messages were sent in 1995?

III. Choose the best answer:

1. The word *e-mail* refers to …
    a) an everyday mail;
    b) an employee's mail address;
    c) an electronic mail.
2. The best explanation of the expression *to come into widespread use* might be …

a) to gain success;
b) to cover a wide field (to be scattered far and wide);
c)to come into action.

3. The verb *broadcast* means ...
a) to sail;
b) to send out a message (by radio, TV. or Internet)
c) to talk to smb.

4. The word *destination* means …
a) (place) a person (vehicle or message) is going to;
b) destiny;
c) a desk.

5. The verb *to retrieve* refers to …
a) to save smb. or smth.;
b) to allow information to be brought back;
c) to talk or write again about smth.

6. The word *modem* means …
a) a modern device;
b) a device used for sending and receiving data over telephone lines;
c) a model.

7. The best explanation of the *domain name* might be …
a) a field of knowledge;
b) a structure containing groups of users;
c) a server.

8. The verb *to delete* means …
a) to bring damages to;
b) to leave out (a word);
c) to decrease.

9. The word *courier* means …
a) a newspaper's name;
b) a person, who carries messages;
c) a sportsman.

10. The verb *to convert* can be paraphrazed as …
a) to pack;
b) to transform;
c) to decode.

11. The word *convention* means …
a) a custom way of doing things;
b) International Telecommunication Congress;
c) a place (or structure) where users can exchange their opinions (information).

12. The verb *to append* stands for …
a) to appoint to smth.;
b) to add smth. to a formal paper or book;
c) to call on smb.

13. The word *Intranet* means …

a) an interactive game;
b) an internal computer network;
c) a special program.

IV. Use the right verb from those given below:

to delete, to deliver, to manage, to mail, to transmit, to travel, to originate, to select, to distribute, to contain, to indicate, to post, to make it possible, to record

1. Modems are communications devices that enable computers … information over telephone lines.
2. An interoffice message … overan intranet.
3. To replace an existing file you should … the file from the File Name list.
4. MS-DOS displays "Are you sure?" if you try … all files in the working drive.
5. Any e-mail message … the user's name, the symbol @, the domain name, the organization's name and the country name.
6. If you want … an e-mail message outside your native country, you should … a supplementary suffix.
7. Mail is easy to send; it's more difficult ….
8. Athene is a free network "magazine".
9. To subscribe, … a request to Jim McCable, McCABE @ MTUS5.
10. This is the first time this article … to "news answers".
11. You can … the reference card by sending an "INFO REFCARD" command.
12. E-mail … to send messages and data data quickly through a worldwide communication network.
13. E-mail data … from the sender's computer to a message transfer agent.
14. Headers and footers … all necessary information about a message being sent.
15. As a rule date files … to the private mailbox.

V. Are the following statements True or False?
1. E-mail provides an efficient means of storing data for reference purposes.
2. The used modem sends a message to one or more recipients by specifying destination addresses.
3. Different addressing conventions are used depending upon the e-mail destination.
4. The principal difference between Intranet and Internet is that Internet enables users to send data.

VI. Read the addressing conventions given below. Imagine what kind of information these addresses are supposed to contain.

Model: rec. music classical @ psicom

Using this address you can get some information about famous composers and musicians, records and concerts.
1. comp. graphics animation – request @ think. com
2. nasa news @ space. mit. edu.

3. rec. music beatles @ psi. com.
4. comp. archives – request @ csl. com.
5. misc. consumers. house – request @ psi. com.
6. news sattelite – request @ edu. ru
7. misc. jobs. offered @ csl. com.
8. alt. radio scanners @ net. ru
9. alt gourmand @ psi. com
10. alt. internet. services @ net. ru

VII. Divide the text into paragraphs.
VIII. Express the main idea of each paragraph in one sentence.
IX. Summarize the text and be ready to retell it.
X. Speak on pros and cons of e-mail.

UNIT 10.

PAGER

I. Consider the following questions in the group of four. A spokesperson will report on your discussion to the whole group
1. Why do you think pagers are so popular with many people, especially young people?
2. Do you know how many paging service companies operate in your town? Name any if you know.
3. Do you remember when first pagers came onto the Belarusian market?
4. What distance can a pager service cover in Belarus?

II. Read the text below and check its comprehension

Pager
1. Introduction.

Pager is a portable, lightweight receiver of coded radio signals that indicates to its user that a *message* is waiting or someone is trying to get in touch. When people want to page someone—that is, contact a person via the person's pager—they telephone a paging service company, which then sends wireless radio signals to the pager. These signals, in turn, *alert the pager's user* by triggering a tone or a vibration. Most pagers can also *deliver* brief *messages* on liquid crystal displays. Because pagers do not rely on telephone wires, a *page* can be transmitted from a central location and received anywhere within the range of the transmitting tower. Pagers make their users easy to contact, even if the user is away from a telephone. As a result, pagers help increase productivity and improve responsiveness to *emergencies* and to business and personal requests.

How a Pager Works

A page is the coded radio signal sent from a transmitter to the pager. Pages usually begin with the *dialing* of a telephone number to the user's paging service provider, a company that *maintains* the paging transmitters and radio equipment. Placing a telephone call to the service provider *enables* the caller *to access* a computerized terminal. The caller hears a tone or receives instructions on how to page a subscriber. If the caller wants to leave a telephone number for the *paged party* to call, the caller can enter that number. Pressing the telephone's pound (#) or star (*) key informs the paging terminal that the message is complete.

The paging terminal automatically *determines* which pager corresponds to the telephone number dialed. It then *routes* a signal to one or more radio transmitters located throughout the paging service area. The area can *vary;* some services are local, while others are networked together via satellite to cover larger regions.

Pagers monitor specific radio frequencies used by the service providers. The transmission of the page is *encoded* so that only the *intended recipient* of the page can receive and decode the message. If the pager is switched on and is within range of the radio tower, the pager will *recognize* the coded signal. The pager then *converts* the signal to data, alerting the owner that a page has been sent with a beep, tone, or vibration. Most pagers have liquid-crystal displays that can show the number of the *calling party*, or short messages. The owner of the pager can telephone the paging party, or call the paging company *to retrieve* other messages.

2. History

The use of radio signals to perform *one-way* notifications began in the 1920s and 1930s. During the same period, mobile radio systems were being developed for police dispatch and public safety services. These early systems *broadcast* messages to all receivers on the band, and they could not be used to contact a specific party.

Paging later developed from a one-to-many *dispatch service* into a system for reaching a single address that corresponded to one pager. Pagers in the 1960s and 1970s were simple devices that used a tone or vibration to alert the subscriber to call a single predetermined number to get the message. Communications satellites are commonly used *to route* pager connections throughout the United States, and in 1998 a satellite failure temporarily silenced millions of pagers across the United States. Pager connections were transferred to another satellite *to restore* service.

Innovations in computer technology have improved pagers, making them smaller, more *affordable,* and loaded with new features. Modern pagers have screens that can display numbers or short messages, and they can *store* those messages for future referral. Pager users can subscribe to special services that broadcast information such as stock market quotations and up-to-the minute sports scores. The next generation of pagers will include the ability to acknowledge reception of a page and respond with a short, predetermined message.

Comprehension Check Up

1. How can you contact a person via his or her pager? 2. What is it a page? 3. How big is the paging service area? 4. Why is the transmission of the page encoded? 5. What can you see on the pager's liquid-crystal display? 6. When did the first notifications using radio signals start? 7. What is the difference between pagers nowadays and those used in 1960s and 1970s? 8. What must be done to maintain paging communication in case of a satellite failure? 9. What are most recent innovations of modern pagers?

III. Choose the best answer.

1. The word *page* refers to …
    a) a boy servant;
    b) one side of a leaf;
    c) surface;
    d) an electronic message sent to a pager
2. The word *message* means…
    a) advice given to someone;
    b) a communication containing some information;
    c) a story;
    d) a present
3. The best explanation of the expression *to alert the pager's user* might be
    a) to worry the pager's user;
    b) to draw attention of the pager's user;
    c) to inform about danger;
    d) to wake up
4. *To deliver a message* implies that one should…
    a) transmit a piece of information to smb.'s pager;
    b) send a letter to smb.;
    c) dial smb.'s number;
    d) speak to smb. on the phone
5. The word *emergency* means …
    a)accident;
    b) sudden occasion requiring immediate action;
    c) evolution;
    d) crisis
6. *To dial a telephone number* refers to…
    a) the action of phoning;
    b) the situation when one forgets a phone number;
    c) the process when one fixes a telephone apparatus;
    d) the process of using a public telephone
7. The verb *to enable* means …
    a) to make smth. quickly;
    b) to make unavailable;

c) to fail;
d) to make possible

8. The verb *to determine* refers to … .
   a) to put an end to;
   b) to free;
   c) to decide or to settle;
   d) to turn aside
9. The best explanation of the *intended recipient* might be … .
   a) Required receiver;
   b) wanted criminal;
   c) planned destination;
   d) requested object
10. The word *one-way* implies … .
   a) simple;
   b) cheap;
   c) easy;
   d) moving or allowing movement in one direction only
11. The expression *paged party* refers to … .
   a) a person who sends a page;
   b) a person to whom a page is transmitted;
   c) a political party mentioned in a paged message;
   d) a party of the king's pages
12. The expression *calling party* means … .
   a) a person calling;
   b) a person who gets a call;
   c) a person crying;
   d) a political party crying
13. The *dispatch service* deals with … .
   a) journalism;
   b) unloading of goods;
   c) speedy delivery of pizza;
   d) sending off or away of any goods
14. The word *affordable* means … .
   a) cheap;
   b) heavy;
   c) to be within one's financial means;
   d) light.

IV. Use the right verb from those given below:

to vary, to encode, to access, to route, to subscribe, to broadcast, to acknowledge to maintain, to restore, to recognize, to convert, to retrieve, to store

1. Communication satellites … pager connections across larger regions.

2. The next generation of pagers will be able …reception of a page and send back a short message.
3. Modern pagers can display messages and … them for future referrals.
4. The paging service provider… the paging transmitters and radio equipment.
5. By dialing the paging service provider the caller … a computerized terminal.
6. The pager … the coded signal and … the signal to data informing the paged party that a page has been sent with a beep, or a tone, or a vibration.
7. The transmission of the page is usually … so that the intended recipient can decode the message.
8. The paging service area can …, some services are local, others are networked via satellites.
9. The owner of the pager can telephone the paging party, or call the paging company … other messages.
10. In the 1920s and 1930s mobile radio systems … messages to all receivers on the band.
11. In case of a satellite failure pager connections can be transferred to another satellite … service.
12. Nowadays pager users can … to special transmitted services.

V. Are the following statements True or False?
1. Pager is a portable, lightweight transmitter of coded radio signals.
2. When we wan to contact a person via his or her pager, we send him or her an e-mail.
3. Most pagers can deliver numbers and brief messages of the calling party on liquid-crystal displays.
4. Pagers monitor specific radio frequencies used by their service providers.
5. Nowadays pagers are small, cheap and are loaded with new features.

VI. Divide the text into paragraphs.
VII. Express the main idea of each paragraph in one sentence.
VIII. Summarize the text and be ready to retell it.
IX. Speak on pros and cons of pager communication.

UNIT 11.

COMMUNICATIONS SATELLITES

I. Consider the following questions in the group of four. A spokesperson will report on your discussion to the whole group.
1. What is a communications satellite?
2. What kind of satellites do you know?
3. What for are satellites used in television?
4. How satellites are put into orbit?

II. *Read the text below and check its comprehension*

Communications Satellites

1. Introduction

A communications satellite is any earth-orbiting spacecraft that provides communication over long distances by reflecting or *relaying* radio-frequency signals.

2. History and Development

Some of the first communications satellites were designed to operate in a passive mode. Instead of actively transmitting radio signals, they served merely to reflect signals that were beamed up to them by transmitting stations on the ground. Signals were reflected in all directions, so they could be picked up by receiving stations around the world. *Echo 1, launched* by the United States in 1960, consisted of an aluminized plastic balloon 30 m (100 ft) in diameter. Launched in 1964, *Echo 2,* was 41 m (135 ft) in diameter. The capacity of such systems was *severely* limited by the need for powerful transmitters and large ground antennas.

Satellite communications currently *make exclusive use of* active systems, in which each satellite carries it own equipment for reception and transmission. *Score,* launched by the United States in 1958, was the first active communications satellite. It was equipped with a tape recorder that stored messages received while passing over a transmitting ground station. These messages were retransmitted when the satellite passed over a receiving station. *Telstar 1,* launched by American Telephone and Telegraph Company in 1962, provided direct television transmission between the United States, Europe, and Japan and could also *relay* several hundred voice channels. Launched into an elliptical orbit inclined 45 ° to the equatorial plane, *Telstar* could only relay signals between two ground stations for a short period during each revolution, when both stations *were in its line of sight.*

Hundreds of active communications satellites are now in orbit. They receive signals from one ground station, amplify them, and then retransmit them at a different frequency to another station. One frequency band used, 500 MHZ wide, is divided into repeater channels of various bandwidths (located at 6 GHZ for upward, or uplink, transmission and 4 GHZ for *downward,* or downlink, *transmission*). A band at 14 GHZ (uplink) and 11 or 12 GHZ (downlink) is also much in use, mostly with fixed (non-mobile) ground stations. An 80-MH Z-wide band at about 1.5 GHZ (up- and downlink) is used with small, *mobile* ground stations (ships, land vehicles, and aircraft). Solar energy cells mounted on large panels attached to the satellite provide power for reception and transmission.

3. Geosynchronous Orbit

A satellite in a geosynchronous orbit *follows a circular orbit* over the equator at an altitude of 35,800 km (22,300 mi) completing one orbit every 24 hours, in the time that it takes the earth to rotate once. Moving in the same direction as the earth's rotation, the satellite remains in a fixed position over a point on the equator, thereby

providing uninterrupted contact between ground stations in its line of sight. The first communications satellite to be placed in this type of orbit was *Syncom 2,* launched by the National Aeronautics and Space Administration (NASA) in 1963. Most of those that followed were also placed in geosynchronous orbit.

4. Commercial Communications Satellites

Deployment and operation of communications satellites on a commercial basis began with the founding of the Communications Satellite Corporation (COMSAT) in 1963. When the International Telecommunications Satellite Organization (*INTELSAT*) was formed in 1964, COMSAT became the U.S. member. Based in Washington, D.C., INTELSAT is owned by more than 120 nations. *Intelsat 1,* known as *Early Bird,* launched in 1965, provided either 2400 voice circuits or one two-way television channel between the United States and Europe. During the 1960s and 1970s, message capacity and transmission power of the *Intelsat 2, 3,* and *4* generations were progressively increased by beaming the satellite power only to the earth and *segmenting* the broadcast spectrum into transponder units of a certain bandwidth. The first of the *Intelsat 4s,* launched in 1971, provided 4000 voice circuits. With the *Intelsat 5* series (1980), introduction of multiple beam operation resulted in additional increases in capacity. A satellite's power could now be concentrated on small regions of the earth, making possible smaller-aperture, lower-cost ground stations. An *Intelsat 5* satellite can typically carry 12,000 voice circuits. The *Intelsat 6* satellites, which entered service in 1989, can carry 24,000 circuits and feature dynamic on-board switching of telephone capacity among six beams, using a technique called *SS-TDMA* (satellite-switched time division multiple access). By the early 1990s, *Intelsat* had 15 satellites in orbit, providing the world's most extensive telecommunications system. Other systems also provide international service in competition with *Intelsat.* By 1997, all regulatory restraints to such competition will have been lifted. The growth of international systems has been paralleled by domestic and regional systems, such as the *U.S. Telstar, Galaxy, and Spacenet* programs and *Europe's Eutalsat and Telecom*.

5. Services

Commercial satellites provide a wide range of communications services. Television programs are relayed internationally, giving rise to the phenomenon known as the "global village." Satellites also relay programs to cable television systems as well as to homes equipped with dish antennas. In addition, very small aperture terminals (VSATs) relay digital data for a multitude of business services. *Intelsat* satellites now carry over 100,000 telephone circuits, with growing use of digital transmission. Digital source coding methods (*see* Telecommunications) have resulted in a ten-fold reduction in the transmission rate needed to carry a voice channel, thus enhancing the capacity of existing facilities and reducing the size of ground stations that provide telephone service.

The International Mobile Satellite Organization (*INMARSAT*), founded in 1979 as the International Maritime Satellite Organization, is a mobile telecommunications

network, providing digital data links, telephone, and facsimile transmission, or fax, service between ships, offshore facilities, and shore-based stations throughout the world. It is also now extending satellite links for voice and fax transmission to aircraft on international routes.

6. **Recent Technical Advances**

Communications satellite systems have entered a period of transition from point-to-point high-capacity trunk communications between large, costly ground terminals to multipoint-to-multipoint communications between small, low-cost stations. The development of multiple access methods has both hastened and facilitated this transition. With TDMA, each ground station is assigned a time slot on the same channel for use in transmitting its communications; all other stations monitor these slots and select the communications directed to them. By amplifying a single carrier frequency in each satellite repeater, TDMA ensures the most efficient use of the satellite's onboard power supply.

A technique called frequency reuse allows satellites to communicate with a number of ground stations using the same frequency by transmitting in narrow beams pointed toward each of the stations. Beam widths can be adjusted to cover areas as large as the entire United States or as small as a state like Maryland. Two stations far enough apart can receive different messages transmitted on the same frequency. Satellite antennas have been designed to transmit several beams in different directions, using the same reflector.

A new method for interconnecting many ground stations spread over great distances *is scheduled to be tested* in 1993, with the *launch* of NASA's ACTS (Advanced Communications Technology Satellite). Known as the hopping spot beam technique, it combines the advantages of frequency reuse, spot beams, and TDMA. By concentrating the energy of the satellite's transmitted signal, ACTS can use ground stations that have smaller antennas and reduced power requirements.

The concept of multiple spot beam communications was successfully demonstrated in 1991 with the launch of *Italsat*, developed by the Italian Research Council. With six spot beams operating at 30 GHZ (uplink) and 20 GHZ (downlink), the satellite interconnects TDMA transmissions between ground stations in all the major economic centers of Italy. It does this by demodulating uplink signals routing them between up- and downlink beams, and combining and remodulating them for downlink transmission.

The application of laser technology to satellite communications has been studied for over a decade. Laser beams can be used to transmit signals between a satellite and earth, but the rate of transmission is limited because of absorption and scattering by the atmosphere. Lasers operating in the blue-green wavelength, which penetrates water, have been used for communication between satellites and submarines.

Comprehension Check Up

1. What is the function of satellites?
2. What is the advantage of geosynchronous orbit?
3. What for were the first communications satellites designed?
4. When did deployment and operation of communications satellites begin?
5. In what way were message capacity and transmission power of the Intelsat 2,3,4 increased?
6. What is a satellite's power now?
7. What are satellites' services?
8. What does *INMARSAT* provide?
9. What is ' frequency reuse'?
10. What technique combines the advantages of frequency reuse, spot beams and TDMA?
11. Can laser beams be used to transmit signals between a satellite and earth?

III. Choose the best answer

1. The word *severely* means …
    a) Separately;
    b) strictly;
    c) normally;
    d) definitely
2. *To follow a circular orbit* implies that one should
    a) not poke his nose into NASA's affairs;
    b) move in a circle;
    c) watch how the satellite is put into orbit;
    d) neglect an elliptical orbit
3. *To make exclusive use s*uggests that…
    a) one uses things made by a distinguished designer;
    b) the use of things is very important;
    c) one uses these things only;
    d) smb. makes nice things for rich people
4. The best explanation of the word *launch* might be
    a) lift-off;
    b) to send into the sky or space;
    c) to have smth. to eat at one's lunch;
    d) set smb./smth. free
5. The word *mobile* means
    a) Phone;
    b) not fixed in one position;
    c) fashionable;
    d) cool
6. *Downward transmission* refers to
    a) the process of going down;
    b) the process of broadcasting from the underground;

c) the process of a going down broadcasting;
d) the process of making smth. on earth

7. *To be in sight* means
a) smth. worth seeing;
b) presence in one's view;
c) to visit a well-known place;
d) not to be blind

8. The verb *to segment* means …
a) to divide;
b) to make equal parts;
c) to divide into segments;
d) to separate

9. The verb *to relay* refers to…
a) the process of being switched on or off;
b) making smth. in another way;
c) the process of sending out by an electrical arrangement or apparatus;
d) laying again

10. *Is scheduled to be tested* suggests that …
a) tests should be made according to the time-table;
b) smth. must be checked;
c) smth. is planned to be checked at a definite future time;
d) smth. should be checked quickly

IV. Use the right word from those given below:

beam up, pick up, refleet, amplify, attach to uninterrupted, deployment, message capacity, enhance, assign, ensure, application

1. By … a single carrier frequency in each satellite repeater, time division multiple access … the most efficient use of the satellite's onboard power supply.
2. The capacity of existing facilities was …. .
3. The satellite provides … contact between ground stations in its line of sight.
4. Signals were … in all directions, so they could be … by receiving stations around the world.
5. Solar energy cells mounted on large panels … the satellite provide power for reception and transmission.
6. Operation and … of communications satellites began in 1963.
7. The … of laser technology to satellite communications has been studied for over a decade.
8. … was progressively increased.
9. The first communications satellites served to reflect signals that were … to them by transmitting stations on the ground.
10. Each ground station is … a time slot on the same channel for use in transmitting its communications.

V. Are the following statements True or False?
1. Commercial satellites provide a wide range of communications services.
2. *Echo 1* was the first active communications satellite.
3. A satellite in a geosynchronous orbit follows an elliptical orbit.
4. Frequency reuse allows satellites to communicate with a number of ground stations.
5. Laser beams can't be used to transmit signals between a satellite and earth because of absorption and scattering by the atmosphere.

VI. Express the main idea of each part in one sentence
VII. Summarize the text and be ready to retell it
VIII. Tell us about the advantages of using communications satellites

UNIT 12.

FIBER OPTICS

I. Consider the following questions in the group of four. A spokesperson will report on your discussion to the whole group.
1. Do you know what fiber optics deals with?
2. What distance can fiber-optic systems cover?
3. Do you know when optical fibers first came into use?

*II. Read the text below and check its comprehension***.**

Fiber Optics

Fiber optics is a branch of optics dealing with the transmission of light through fibers or thin rods of glass or some other *transparent* material of high refractive index. If light is admitted at one end of a fiber, it can travel through the fiber with a very low loss, even if the fiber is curved.

The principle on which this transmission of light depends is that of total internal *reflection*: Light traveling inside the fiber center, or core, *strikes* the outside surface at an *angle* of incidence greater than the critical angle, so that all the light is reflected toward the inside of the fiber without loss. Thus light can be transmitted over long distances by being *reflected* inward thousands of times. In order to avoid losses through the scattering of light by impurities on the surface of the fiber, the optical fiber core *is clad* with a glass layer of much lower refractive index; the reflections *occur* at the interface of the glass fiber and the cladding.

The simplest application of optical fibers is the transmission of light to locations otherwise hard to reach, for example, the bore of a dentist's drill. Also, bundles of several thousand very thin fibers assembled precisely side by side and optically polished at their ends, can be used to *transmit* images. Each point of the image *projected* on one face of the bundle is reproduced at the other end of the bundle, *reconstituting* the image, which can be *observed* through a magnifier. Image

transmission by optical fibers is widely used in medical instruments for viewing inside the human body and for laser surgery, in facsimile systems, in phototypesetting, in computer graphics, and in many other *applications*.

Optical fibers are also being used in a wide *variety* of sensing devices, ranging from thermometers to gyroscopes. The potential of their applications in this field is nearly unlimited, because the light sent through them is *sensitive* to many environmental changes, including pressure, sound waves, and strain, as well as heat and motion. The fibers can be especially useful where electrical effects could make ordinary *wiring* useless, less accurate, or even hazardous. Fibers have also been developed to carry high-power laser beams for cutting and drilling.

One growing application of optical fibers is in communication. Because the information-carrying capacity of a signal increases with frequency, the use of laser light offers many *advantages*. Fiber-optic laser systems are being used in communications networks. Many *long-haul* fiber communications networks for both transcontinental connections and, through undersea cables, international connections are *in operation*. One advantage of optical fiber systems is the long distances that can be *maintained* before signal repeaters are needed to *regenerate* signals. These are *currently separated by* about 100 km (about 62 mi), compared to about 1.5 km (about 1 mi) for electrical systems. Newly developed optical fiber *amplifiers can extend* this distance even farther.

Local area networks are another growing application for fiber optics. Unlike long-haul communications, these systems connect many local *subscribers to* expensive centralized equipment such as computers and printers. This system expands the utilization of equipment and can easily *accommodate* new users on a network. Development of new electro-optic and integrated-optic components will further *expand* the capability of fiber systems.

Comprehension Check Up

1. What is fiber optics?
2. What is the principle of light transmission?
3. How can we avoid losses during transmission?
4. Where do the reflections occur?
5. How can one transmit images using optical fibers?
6. Where is image transmission used?
7. Why do applications of sensing devices are almost unlimited?
8. Why are optical fibers widely used in communication?
9. How can subscribers get the benefit from systems with optical fibers?
10. What will further expand the capability of fiber systems?

III. Chose the best answer

1. *Fiber optics* refers to…
   a) a number of threads used to make ropes;
   b) scientific study of light;
   c) the process of using thin threads of glass to carry information;

d) the burning material

2. The word *reflection* means…
   a) a perfect example of smth.;
   b) an image reflected in a mirror or similar surface;
   c) permission;
   d) natural ability to react quickly
3. The best explanation of the word *subscriber* might be…
   a) a person who does part of the work of another person;
   b) a thief;
   c) an instrument for cutting wood, metal;
   d) someone who gives money for a service
4. The verb *to project* means …
   a) to make a picture on a film, photo, etc.;
   b) to design;
   c) to make progress;
   d) to prohibit
5. The word *variety* implies…
   a) the amount of money that smth. is worth;
   b) an action;
   c) velocity;
   d) a lot of things that are different from each other
6. The best explanation of the word *long-haul* might be…
   a) something that lasts for a long time;
   b) long hair;
   c)something that goes very long distance;
   d) deep hole
7. The word *currently* means…
   a) long time ago;
   b) at present;
   c) soon;
   d) quickly
8. The word *transparent* refers to…
   a) something that allows light to pass through it;
   b) transport;
   c) smth. that moves quickly;
   d) people who haven't got their own children and raise abandoned children
9. The word *application* refers to …
   a) the process of fixing smth. to smth.;
   b) solution;
   c) practical purpose for which a machine, an idea can be used;
   d) escape.
10. The verb *to extend* means…
   a) to show smth.;
   b) to explain smth.;

c) to expect smth. to happen;
d) to make smth. bigger or longer.

11. The word *angle* deals with…
a) a spirit who lives with God in heaven;
b) a close relative;
c) the space between two straight crossed lines,
d) an Englishman.

12. The word *sensitive* means…
a) Changeable;
b) able to react to very small changes of heat, light;
c) sincere;
d) simultaneous.

IV. Use the right verb from those given below:

to expand, to transmit, to accommodate, to occure; to observe, to strike, to reconstitute, to regenerate, to reflect, to separate, to clothe (clad)

1. To … the reconstituted image we should use a magnifier.
2. In order to avoid losses we should … the core of the fiber with glass layer.
3. Projection of the image on the bundle … the same image at the other end of the bundle.
4. The capabilities of fiber systems will be … with the designing of various optic components.
5. The outside surface is … by light traveling inside the fiber.
6. The long distances are … for electrical systems.
7. Fiber bundles are used to … images.
8. Signal repeaters are used to … signals.
9. Local area networks … new uses on a network.
10. Light mailing along the core is … toward the inside of the fiber.
11 The reflections … at the interface of the optical fiber and glass layer of much lower refractive index.

V. Are the following statements True or False?
1. Fiber optics deals with the transmission of light through opaque materials.
2. The fibers are used where electrical effects could make ordinary wiring useless and less accurate.
3. In order to avoid losses the optical fiber core is cleaned from a glass layer.
4. The fibers are absolutely useless where electrical effects could make ordinary wiring useful and more accurate.
5. Long-haul fiber communication networks are used for international and transcontinental connections.

VI. Divide the text into paragraphs.

VII. Express the main idea of each paragraph in one sentence.
VIII. Summarize the text and be ready to retell it
IX. Speak on pros and cons of fiber optics if any.

PART II.

SUPPLEMENTARY READING

UNIT 1.

CELLULAR RADIO TELEPHONE

I. Read the text.
II. Divide each part of the text into paragraphs.
III. Express the idea of each paragraph in one sentence.
IV. Write a summary of the text in English.

Cellular Radio Telephone

1. Introduction

Cellular radio telephone is also called cellular telephone or cell phone, it is alow-powered, lightweight radio transceiver (a combination transmitter-receiver) that provides voice telephone service to mobile users. Cellular telephones operate as portable telephones; whereas normal telephones require a cord that connects to a jack in order to access the extensive wireline networks operated by local telephone companies, cellular telephones are not restricted by a cord. Cellular telephones have become very popular with professionals and consumers as a way to communicate while away from their regular phones, while traveling, or when in remote locations lacking regular phone service.

Cellular telephones work by transmitting radio waves to cellular towers. These towers vary in the area they cover and can receive nearby cellular telephone signals from distances as short as 1.5 to 2.4 km (1.0 to 1.5 mi) to distances as long as 48 to 56 km (30 to 35 mi). The area a tower can cover is referred to as a *cell;* the towers within these cells are networked to a central switching station, usually by wire, fiber-optic cable, or microwave. The central switching station handling cellular calls in a given area is directly connected to the rest of the wired telephone system. Cellular calls are picked up by the towers and relayed to the rest of the telephone network. Since the cells overlap, as a mobile caller moves from one cell into another, the towers "hand off" the call so communication is uninterrupted.

Cellular phone networks exist in most metropolitan areas, and cellular coverage is increasing in rural areas. Due to the convenience and mobility of cellular telephones, users generally pay a higher fee than they would for normal telephone use. A newer generation of cellular radio technology, called Personal Communications Services (PCS), operates much like earlier cellular services, but at higher frequencies (around 1900 MHz). PCS also utilizes completely digital transmissions, rather than the analog transmissions that many current cellular

telephones use. Digital transmissions convert sound into digital form, which can be transmitted faster and more efficiently than analog signals.

2. Cellular Radio Telephone Mechanics

Both cellular radio and PCS use high-frequency radio waves to transmit calls. High-frequency waves have short wavelengths that pass by a given point at a very high rate. High-frequency waves provide better sound quality than lower-frequency waves (such as AM radio) and ensure reliable cellular links to and from towers over short distances. However, high-frequency signals cannot effectively travel as far as low-frequency signals. For cellular networks, this limited range is advantageous, because it means the same frequencies can be reused at nearby locations. This ability to reuse frequencies is helpful, because there are a limited number of radio frequencies available to cell phone companies. It also allows cellular network providers to accommodate a larger number of users.

The transceiver inside a cellular phone is a much more complex device than a conventional phone used over the wireline network. A cellular telephone has circuitry that creates a unique identity code that is used to locate and track the telephone. This identity code is necessary for coordinating calls to and from the telephone, and for billing such calls. Because a cellular telephone user may move quite a distance during the duration of a call, the cellular radio network must manage calls from different tower sites as the telephone moves out of the range of one tower and into the range of another tower.

New cellular telephones have several features. These new phones have a small liquid crystal screen that can display the telephone number that is being called, the number of an incoming call, or a short text message, much like a pager displays this information. Other types of cellular telephones have a variety of functions that include a memory for frequently called numbers and a lock to deter theft. Because mobile telephones use radio waves to send and receive calls, the device must include a power source. Rechargeable batteries provide the usual source of power, but most cell phones can also be attached to the cigarette lighter in a vehicle or to some other external power device.

3. The Cellular Network

The cells in a cellular radio network refer to the coverage area of each tower that receives and transmits calls from mobile telephones. The cells are arranged in a honeycomb pattern (hence the name *cellular*) and, in fact, overlap so that the system can handle increases in anticipated telephone traffic volume. Network management functions, performed at a central facility known as a Mobile Telephone Switching Office (MTSO), include the ability to measure and compare the transmission quality between a single handset and multiple towers. This function is important so that the MTSO can select the best transmission link between mobile telephones and towers. This optimal link is then used to pass transmissions from one tower to another as the mobile telephone moves between cells.

All cell towers in a given area connect with the MTSO, which in turn has links to the wireline local exchange carrier that handles normal telephone calls. The link

between the MTSO and the wireline local telephone company is essential for connecting wireless and wireline calls. The vast majority of calls handled by a cellular radio network either begin on the wireline network or end there.

4. History

The first commercial cellular telephones were tested in the late 1970s by Illinois Bell in Chicago, and were a great success. Cellular service carriers began nationwide operations in the mid-1980s operating in the 800- to 900-MHz frequency band. Before the availability of cellular radio service, mobile telephone service consisted of bulky mobile telephone radio units. These two-way radio units communicated with a single antenna in a city or area. The radio signals often interfered with those of other commercial radios, and due to the technology of the day the frequencies could not be reused as they can today. Therefore, limited numbers of channels were available for callers, and the service was unreliable and costly. Because of the consumer demand for cellular telecommunications, the Federal Communications Commission (FCC) in the mid-1990s authorized up to six additional mobile telephone service providers in each service area.

As of December 1997, according to the Cellular Telephone Industry Association, the United States had more than 53 million wireless subscribers, with the number of new users increasing significantly. The new digital PCS system appears likely to attract many more subscribers in the next few years as well. Forecasters and regulators were not expecting such success, however. Network equipment and start-up costs were substantial, and the cost to consumers was high. Providers had limited their networks to a small group of high-volume business users who had little concern about the price of service. Eventually, the providers recognized that they would be better off creating innovative service packages and aggressively marketing their services to the general public. As a result, prices for cellular telephones and network access have dropped considerably.

Cellular radio telephone service has achieved great commercial success, because users recognize that mobile telephone access can improve productivity and enhance safety. Delivery drivers, repair technicians, lawyers, and other professionals were early adopters of mobile telephone service. As more geographic areas are covered by cellular networks and as rates drop, new subscribers are buying cellular services for personal security, safety on the road, and general convenience.

UNIT 2.

GLOBAL POSITIONING SYSTEM (GPS)

I. Read the text.
II. Divide each part of the text into paragraphs.
III. Express the idea of each paragraph in one sentence.
IV. Write a summary of the text in English.

Global Positioning System (GPS)

1. Introduction

Global Positioning System (GPS) is a space-based radio-navigation system, consisting of 24 satellites and ground support. GPS provides users with accurate information about their position and velocity, as well as the time, anywhere in the world and in all weather conditions.

2. History and Development

GPS, formally known as the Navstar Global Positioning System, was initiated in 1973 to reduce the proliferation of navigation aids. GPS is operated and maintained by the United States Department of Defense. By creating a system that overcame the limitations of many existing navigation systems, GPS became attractive to a broad spectrum of users. GPS has been successful in classical navigation applications, and because its capabilities are accessible using small, inexpensive equipment, GPS has also been used in many new applications.

3. How GPS Works

GPS determines location by computing the difference between the time that a signal is sent and the time it is received. GPS satellites carry atomic clocks that provide extremely accurate time. The time information is placed in the codes broadcast by the satellite so that a receiver can continuously determine the time the signal was broadcast. The signal contains data that a receiver uses to compute the locations of the satellites and to make other adjustments needed for accurate positioning. The receiver uses the time difference between the time of signal reception and the broadcast time to compute the distance, or range, from the receiver to the satellite. The receiver must account for propagation delays, or decreases in the signal's speed caused by the ionosphere and the troposphere. With information about the ranges to three satellites and the location of the satellite when the signal was sent, the receiver can compute its own three-dimensional position.

An atomic clock synchronized to GPS is required in order to compute ranges from these three signals. However, by taking a measurement from a fourth satellite, the receiver avoids the need for an atomic clock. Thus, the receiver uses four satellites to compute latitude, longitude, altitude, and time.

4. The Parts of GPS

GPS comprises three segments: the space, control, and user segments. The space segment includes the satellites and the Delta rockets that launch the satellites from Cape Canaveral, in Florida. GPS satellites fly in circular orbits at an altitude of 20,100 km (12,500 mi) and with a period of 12 hours. The orbits are tilted to the earth's equator by 55 degrees to ensure coverage of polar regions. Powered by solar cells, the satellites continuously orient themselves to point their solar panels toward

the sun and their antennae toward the earth. Each satellite contains four atomic clocks.

The control segment includes the master control station at Falcon Air Force Base in Colorado Springs, Colorado, and monitor stations at Falcon Air Force Base and on Hawaii, Ascension Island in the Atlantic Ocean, Diego Garcia Atoll in the Indian Ocean, and Kwajalein Island in the South Pacific Ocean. These stations monitor the GPS satellites. The control segment uses measurements collected by the monitor stations to predict the behavior of each satellite's orbit and clock. The prediction data is *uplinked,* or transmitted, to the satellites for transmission to the users. The control segment also ensures that the GPS satellite orbits and clocks remain within acceptable limits.

The user segment includes the equipment of the military personnel and civilians who receive GPS signals. Military GPS user equipment has been integrated into fighters, bombers, tankers, helicopters, ships, submarines, tanks, jeeps, and soldiers' equipment. In addition to basic navigation activities, military applications of GPS include target designation, close air support, "smart" weapons, and rendezvous. With more than 500,000 GPS receivers, the civilian community has its own large and diverse user segment. Surveyors use GPS to save time over standard survey methods. GPS is used by aircraft and ships for en route navigation and for airport or harbor approaches. GPS tracking systems are used to route and monitor delivery vans and emergency vehicles. In a method called *precision farming,* GPS is used to monitor and control the application of agricultural fertilizer and pesticides. GPS is available as an in-car navigation aid and is used by hikers and hunters. GPS is also used on the Space Shuttle. Because the GPS user does not need to communicate with the satellite, GPS can serve an unlimited number of users.

5. GPS Capabilities

GPS is available in two basic forms: the standard positioning service (SPS) and the precise positioning service (PPS). SPS provides a horizontal position that is accurate to about 100 m (about 330 ft); PPS is accurate to about 20 m (about 70 ft). For authorized users—normally the United States military and its allies—PPS also provides greater resistance to jamming and immunity to deceptive signals.

Enhanced techniques such as differential GPS (DGPS) and the use of a carrier frequency processing have been developed for GPS. DGPS employs fixed stations on the earth as well as satellites and provides a horizontal position accurate to about 3 m (about 10 ft). Surveyors pioneered the use of a carrier frequency processing to compute positions to within about 1 cm (about 0.4 in). SPS, DGPS, and carrier techniques are accessible to all users.

The availability of GPS is currently limited by the number and integrity of the satellites in orbit. Outages due to failed satellites still occur and affect many users simultaneously. Failures can be detected immediately and users can be notified within seconds or minutes depending on the user's specific situation. Most repairs are accomplished within one hour. As GPS becomes integrated into critical operations such as traffic control in the national airspace system, techniques for monitoring the

integrity of GPS on-board and for rapid notification of failures are being developed and implemented.

6. The Future of GPS

As of March 1994, 24 GPS satellites were in operation. Replenishment satellites are ready for launch, and contracts have been awarded to provide satellites into the 21st century. GPS applications continue to grow in land, sea, air, and space navigation. The ability to enhance safety and to decrease fuel consumption will make GPS an important component of travel in the international airspace system. Airplanes will use GPS for landing at fogbound airports. Automobiles will use GPS as part of intelligent transportation systems. Emerging technologies will enable GPS to determine not only the position of a vehicle but also its altitude.

UNIT 3.

TECHNOLOGY AND THE MEDIA

I. Read the text.
II. Divide the text into introduction, principal part, conclusion.
III. Express the idea of each part/paragraph in one sentence.
IV. Write a summary of the text in English.

Technology and the Media

The sense that the world is in the middle of a continuing communications revolution has been strong since the 1960s when television made its great breakthrough. It was then that the Canadian writer on communications, Marshall McLuhan, made his memorable statements that "the medium is the message" and that the world was becoming a global village. It was then too that the word "media" became part of daily speech, covering not only electronic media, live television, but older print media, particularly the press.

Comparisons were drawn between the progress and the development of television in the 20th century and the advent and diffusion of printing in the 15th and 16th centuries. Yet much had happened between. It was not until the 19th century that the newspaper became the dominant pre-electronic medium, following in the wake of the pamphlet and the book and in the company of the periodical. It was during the 19th century also that the communications revolution speeded up, beginning with transport, the railway, and leading on through the telegraph, the telephone, radio, and motion pictures into the 20th-century world of the motor car and the airplane. Not everyone sees that process in perspective. It is important to do so.

It is generally recognized, however, that the introduction of the computer in the 20th century, followed by the invention of the integrated circuit during the 1960s, radically changed the process, although its impact on the media was not immediately apparent. It now became possible to combine thousands, later millions, of individual transistors on a single chip. Computers became smaller and more powerful. They

became "personal" too, as well as institutional, with memory and storage increasing and display becoming crisper. They were thought of, like people, in terms of generations, with the distance between generations much smaller.

It was within the computer age that the term "information society" acquired wide currency to describe the context within which we now live. Advanced countries, it was claimed, were evolving from an industrial to an information society. The term "industrial revolution" had been used before the term "communications revolution," and now these two "revolutions" were compared. They had each influenced both work and leisure and how we think and feel both about place and time, but in each case there had been controversies about their economic, political, social, and cultural implications. "Benefits" were weighed against "harmful" outcomes. Generalizations proved difficult. The press and the journalists who wrote for it had always had their critics. Television was attacked more comprehensively for "consuming much [time and] energy" while ignoring "the fundamentals of life."

Not everyone agreed—or agrees—about the "causes" of the communications revolution. Were there single causes of particular episodes in it? The words "cause" and "effect," which have been applied to each technological change in turn, from the steam engine to the computer, are quite inadequate. It has never been possible to isolate each single effect, big or small. Technology by itself does not explain. The same technology was used in quite different ways in different political and social contexts. In Britain, for example, the national broadcasting agency had a monopoly both of radio and television until 1955, and was financed by license fee, not by advertising. In the United States broadcasting from the beginning, radio and television, was dependent on advertising and on the business system. In some other countries, including the Soviet Union, all the media were viewed as instruments of propaganda. Such differences of purpose led to differences in programming, both news and entertainment. Only with satellite television and the prospects of "globalization" were national systems threatened and with them, it was often argued—the debate continues—"national cultures."

McLuhan, fascinated by the universal pervasiveness of television, thought of it as an effect, not as the cause of effects. Each medium, printed or electronic, had its own inherent characteristics, whatever its context. He had little to say about ownership or control of the media, an issue always in the forefront after the advent of satellite television. His views now seem dated, as does his language. Despite the popular use of the term global village, television did not create a new one. The words "network" and "web" seem far more appropriate. Another new phrase of the 1990s, "information superhighway," also demands critical attention. This raised the question of "access" to new technology just as the industrial revolution had raised questions of distribution of wealth as well as of its production. The aspiration, eloquently formulated in the United States, was to make the superhighway available to "as many voices, eyes and ears as possible."

Meanwhile, within the changing communications pattern, the Internet, with less rhetoric, has been perhaps the most interesting development and has certainly most captured the imagination. At first, in the 1960s, the purposes of the Internet

were limited, as were its users. The "web," as it came to be called, was designed to serve military and academic needs. Soon, however, as a "world web," it attracted a wide range of participants, becoming an electronic exchange system, operating from below. Accessed, often graphical, "pages" of information with embedded addresses, allowed users of all ages and types to link to other sites at the click of a "mouse" button. The "pages" created constituted "hypertext," allowing compilation of pictures and words. There was scope for the exchange not only of information (with varying degrees of authenticity) but of ideas and creativity. The distinction between "producers" and "consumers" of content lost much of its point. For a time they had seemed—and still seem—like high priests of the media.

The most important technological changes in communications since the 1960s, apparent in the way that both the Internet and the media have developed, have all involved what has been called "convergence" or what in France has been described more poetically as "the ballet of the electrons." Digital technology, bringing together computing and solid-state electronics, certainly revolutionizes (this time the word cannot be argued about) telecommunications and the media. Binary digit signals enable language, numbers, images, patterns, and music to be communicated through a common technology. The possibilities seem almost limitless. They would have seemed in the past to have belonged not to science but to science fiction. The word "information" itself seems to be inadequate. It covers "entertainment," as it did in the McLuhanesque period, raising different issues, and it encompasses ways of learning as well as of communicating. It is difficult to keep a sense of perspective given the rate and scale of change.

Because of the scale, it is now as necessary to look at the 1960s in perspective as it is to look at the invention of printing or the railway in perspective. One thing is as beyond doubt as the relevance of the word "revolutionary." The continuing communications revolution has brought the media not only into the library or the office but into the home. The modern home has been a place of entry not only for books, magazines, newspapers, cassettes, discs, and videos but for "hardware," including radio and television sets, record players, telephones, typewriters, cameras, projectors, calculators, and computers. Each has its own history: each poses distinct questions about technology and use. And even if it is difficult to establish perspectives, it is essential to identify the linkages that exist—or can exist—between all these gadgets. They are all products, hardware or software, of the continuing communications revolution. Each one, of course, has had its effect on the particular home, and not all modern homes include these gadgets, many of them much advertised. Their physical presence and access to them depends on family income and choice. Nonetheless, what were once thought of as luxuries—television sets, for example—become to be thought of as necessities, and what were once thought of as "novelties" (with an element of miracle about them) begin to be taken for granted. It is tempting, indeed, to believe that the "technology of tomorrow" is already here.

The questions multiply. What will be the next stages? Will old media disappear? For example, what will happen to the book or to the compact disc? How will the newspaper change? Will it ever become completely electronic? Can public

broadcasting survive? What is the future of digital terrestrial television? Will we have new business alliances and consortia? They are already forming. At the individual level will E-mail displace letters or fax? Will the relationship between media producers and editors and users (or customers) become more interactive?

At the more fundamental level will digitalization divide the world even more than at present into "haves" and "have nots"—those countries that have the capacity and ability to develop new digitalized networks and those that do not? Will the concentration of economic power in the hands of those who now own quite different segments of media—from books to motion pictures and from cable to satellite—endanger individual freedom? Will the opportunity of choice, offered to individuals, mean that the field of choice will be genuinely widened? May we not have more and more of the same thing?

It is logical to separate out questions relating to technological developments from questions relating to ownership and control, but, in practice, visions of the future world involve bringing them together. It is difficult in present circumstances to avoid the blurring of "image" (seeing the world as it is presented to us or as we present it to ourselves) and "reality." Can "truth" survive? The media in their mediation can create what has come to be called "virtual reality"; and Internet can offer fantasy ways of escaping from the restraints of life as it is lived to a world of cyberspace. Cyber words have multiplied during the 1980s and 1990s—from "cybernaut" to "cyborg" through a whole new vocabulary.

UNIT 4.

MARCONI AND HIS INVENTION

I. Read the text.
II. Divide the text into introduction, principal part, conclusion.
III. Express the idea of each part/paragraph in one sentence.
IV. Write a summary of the text in English.

Marconi and His Invention

Italian electrical engineer Guglielmo Marconi was the first to create a practical system for communicating over long distances using radio signals. News reports in issues of *Scientific American* from 1902 to 1903 recorded Marconi's first successful transmissions and receptions of radio signals across the Atlantic Ocean. The magazine also presented a profile of Marconi, who was described as being plagued by the untiring pursuit of the "modern press."

The Marconi Transoceanic Experiments
January 4, 1902

The SCIENTIFIC AMERICAN is enabled to present to its readers the first photographs that have been taken of Marconi's station at Signal Hill,

Newfoundland—a station which will hereafter be memorable as the first place where a transoceanic wireless message was received.

That the signals were received can hardly be doubted. Marconi himself has publicly stated that the signals were heard with certainty and distinctness. At the Signal Hill station a receiving wire was employed about 400 feet high, which was supported by a kite. At Cornwall, the transmitting station was provided with an apparatus which was much more powerful than that previously used for communicating at distances of 200 miles. Even with a transmitter of increased power, the signals were heard only with the aid of a most sensitive telephone receiver. Before leaving England, Marconi had made elaborate arrangements to transmit the letter S of the Morse alphabet at a certain time. From English reports it would seem that the letter was telegraphed many times without appreciably affecting the Newfoundland receiver, until the memorable Wednesday of December 11, 1901. But upon this point nothing definite is yet known. We must await the paper which Marconi has promised to read as soon as possible before some scientific society. Marconi has had unusual technical difficulties to contend with. His poles have worked very unsatisfactorily; and the balloons and kites have not given the results that he expected. In Newfoundland a pole 130 feet high has been erected with all possible care, and yet it will not be able to withstand one of the violent gales so prevalent at this time of the year along the Canadian Atlantic coast. When it is considered that the poles cost $1,200 each, how enormous is the expense of experimenting can easily be appreciated.

At present, Marconi is endeavoring to reduce the height of the masts. But until he has solved the problem of operating nearer to the surface, he will probably construct for the purpose of his work a tower of such size that it cannot be blown down. In the experiments of Thursday, December 12, the kite was lost within one minute after the receipt of the letter "S."

The announcement of his success has earned for Marconi a popularity which is not the fortune of all inventors. The Canadian government has determined to stand by him in his fight against the Anglo-American Cable Company. Officials have honored him everywhere. At a dinner given to Marconi, Governor Boyle spoke glowingly of Marconi's achievement. Marconi replied: "If my system of wireless telegraphy can be commercially established between different parts of the earth, the possibility of which I may state I have not the slightest doubt, it would bring about an enormous cheapening in the methods of communication at present existing. The system of submarine cables of to-day fulfills the demand of communication to a great extent. But the great cost of the cables themselves and their heavy working expenses place the existing method beyond the reach of a majority of the people inhabiting the various countries of the world. But could this new method be applied, I believe the cost of what we now call cabling to England might be reduced at least twentyfold. I do not see why, eventually, with the wireless system, this cost should not be reduced to one cent a word or less.… This colony of Newfoundland is the first in which a message was received by cable, across the ocean, and I am glad to say it has also been the first to receive a message across this same ocean without a cable."

Although they have unlimited confidence in Marconi's ability and rely implicitly upon his honesty, many scientists are by no means convinced that transoceanic wireless telegraphy is certain. Edison believes that success would not have been attained, perhaps, if Marconi had attempted to transmit an entire sentence. Moreover, the receiver was not the ordinary apparatus, but a telephone of the most delicate construction, and most sensitive in operation. Even with this fine instrument the signals are said to have been barely distinguishable. When these facts are kept in view, the necessity of further and more elaborate experiments and the transmission of entire messages is apparent.

The Newfoundland work is of interest technically, not only by reason of the enormous distance involved, but also by reason of the fact that the ratio of mast height to distance was not maintained. From the reports it would seem that poles were used in Cornwall no greater in height than those commonly employed for the transmission of messages for 50 or 60 miles. The curvature of the earth, formerly considered a formidable obstacle, seems to have but little effect upon the transmitted waves. Between England and Canada there is a huge curve 100 miles high. The amount of electrical energy required varies as the square of the distance. Up to the time of these last experiments Marconi had succeeded in telegraphing some 400 miles. To telegraph 1,800 miles would necessitate the expenditure of energy twenty times as great. Whether this ratio held good in the case of the transatlantic signals remains to be seen.

Marconi Sends Messages Across the Atlantic
January 3, 1903

It is now authoritatively announced by Marconi, himself, that wireless messages have been transmitted between the Old and the New World. Messages were sent from Lord Minto, Governor-General of Canada, and from Marconi, to King Edward. Messages were likewise sent to the King of Italy, by Marconi and by Commander Martino of the Italian cruiser "Carlo Alberto"; other messages were from Dr. Parkin to the London Times, and from Richard Cartwright of Canada to the Times.

The message to the King of England read as follows: "To Lord Knollys, Buckingham Palace, London:

"On the occasion of the first wireless telegraphic communication across the Atlantic Ocean may I be permitted to present by means of this wireless message, transmitted from Canada to England, my respectful homage to his Majesty the King? MARCONI."

The message to the King from the Earl of Minto read:

"To his Majesty the King, London:

"May I be permitted by means of this wireless message to congratulate your Majesty on the success of Marconi's great invention, connecting England and Canada? MINTO."

The following message by wireless telegraphy was received from the King of Italy by Signor Marconi in reply to the inventor's transatlantic marconigram:

"I learn with the keenest pleasure of the great results you have achieved. They constitute a fresh triumph for you to the greater glory of Italian science. "VICTOR EMMANUEL."

Marconi states that it was about a month ago that he succeeded in transmitting messages from Table Head to Cornwall. First, the messages were all in code and were simple queries, such as "How is this?"

In many respects this achievement of Marconi is fully equal to that of Cyrus Field in opening communication between America and England by means of the submarine cable. But the distance covered by Marconi is greater than that over which the first submarine cable extended, by about 300 miles. So far as practical results are concerned, the Anglo-Italian inventor may well be regarded as the pioneer of commercial wireless telegraphy. Where others have failed he has succeeded.

The First Wireless Message from the United States to England
January 31, 1903

On the night of January 18, Marconi succeeded in outdoing himself when he transmitted a message of greeting from President Roosevelt to King Edward directly from the Cape Cod station to Poldhu, England. The distance covered is greater by 600 miles than that over which messages have previously been sent.

The performance is all the more remarkable when it is considered that the message was sent without any previous attempt to establish communication by preliminary signals.

It was on Sunday, January 18, that President Roosevelt sent to Marconi, by the ordinary telegraph, a message for King Edward. The message read as follows:
"*His Majesty King Edward VII., London, by Marconi Transatlantic Wireless Telegraphy:*

"In taking advantage of the wonderful triumph of scientific research and ingenuity which has been achieved in perfecting a system of wireless telegraphy, I extend, on behalf of the American people, most cordial greetings and good wishes to you and to all the people of the British Empire. THEODORE ROOSEVELT. "Washington, D. C."

Marconi's success came unexpectedly. After having busied himself all day in preparing his sending apparatus, he began to practise sending President Roosevelt's message without calling either the Poldhu or the Glace Bay station, contrary to the arrangements which he had made. Thinking that he might not be able to get the English station for a day or two, he decided to send the President's message by way of the Glace Bay station. Calling up the operator there he gave him the message with instructions to forward it to England. To Marconi's astonishment he received a reply from Glace Bay that the operator had been informed by the station at Poldhu that the message had been received directly from Cape Cod. There was not the slightest hitch in the process of sending. About four minutes were required to transmit the entire message.

King Edward replied to the message which he received from the President by cable as follows:

"SANDRINGHAM, January 19, 1903.

"*The President, White House, Washington, D. C., America:*

"I thank you most sincerely for the kind message which I have just received from you through Marconi's transatlantic wireless telegraphy. I sincerely reciprocate in the name of the people of the British Empire the cordial greetings and friendly sentiment expressed by you on behalf of the American nation, and I heartily wish you and your country every possible prosperity. "EDWARD, R. AND I."

The King sent his message by cable for the reason that Marconi was adjusting his instrument for sending tests to England and did not wish to upset his plans by making any attempt at receiving from the other side of the ocean.

An Impression of Marconi
February 7, 1903

Only five years have passed since the general public first heard of Marconi. Scientists, to be sure, had known of him as a young man who was carrying on the work of Hertz and his immediate successors. When, however, Marconi made his first successful experiments in transmitting messages for short distances without wires, the newspaper men scented a good "story," and proceeded to write him up for a sensation-loving world in their best and most flaring style. He is now one of the most "interviewed" of public men. Reporters hunt him; and when they drive him to cover, they haunt him. Hardly a day passes but he is talked at, questioned as to his work, and begged to give some exclusive bit of information. He has been photographed in all possible positions. He has been interviewed at all possible times, and sometimes at impossible times. Clearly Marconi has learnt that fame is its own punishment; and that he must submit to the delicate torments of the inquisition instituted by the modern press. No wonder that he leaves the impression of being intensely wearied by interviewers. At best he is but pleasantly unhappy with them.

When you meet him for the first time, you know that he is not a cordial man; and yet you feel that he will not rebuff you, that he will probably do for you what he can. His manner is that of chilly reserve. In the press he is referred to as "the young Anglo-Italian" who has done some startling things which are not very clearly explained. "Anglo-Italian" may be a designation accurate enough politically; it is hardly characteristic of the man as he appears in the flesh. Italian blood flows in his veins, it is true; but he is English for all that—English in his bearing, English in his dress, English in his speech, save for the least perceptible foreign intonation. Not the faintest spark of southern fire ever flares up within him. A cool, calculating man of the North, is this so-called Anglo-Italian.

For a successful inventor Marconi appears the least joyous of men. His features are melancholy in expression. They are those of a man fast approaching forty—not those of a man of twenty-eight. His face is impassive, his eye almost cold. When he smiles he half shuts his eyes, wrinkles the muscles of his cheek, and draws up the corners of his mouth. It is not a pleasant smile.

If you visit Marconi with the expectation that he will do the most of the talking, you will find that you are grievously mistaken. You must do the talking yourself. To

be sure, he answers questions frankly and fully; but he will not converse voluntarily. You discover quickly enough that his reticence is the reticence of modesty. When he discusses the Marconi system of wireless telegraphy, he refers to it as "our" system, not as "my" system. He praises where praise is due, recognizing fully that it is not given to any one man to learn all the secrets of science, and that great results are attained usually by the co-operation of many minds working to a common end. He acknowledges fully and openly how important to himself has been the work of his predecessors, and even that of some of his contemporaries. "The success of the experiments with which I have been engaged is the logical result of the work of myself and of my assistants in the last few years, and of scientific investigations of the latter part of the century," he himself says. "Revolutionize" is a word not included in the vocabulary which he uses to describe the possibilities of his invention. He frankly admits that it is not his purpose to render submarine cables useless; he is satisfied if he can successfully compete with them; or if he can only make them cut down their present rates.

And yet, he talks of his system with a certain air of easy confidence, which leads you to infer that if any man will ever succeed in outdoing the submarine cables, it is Guglielmo Marconi. It is not often that he prophesies; and when he does, you feel that he knows; or as he himself puts it, "It is not my policy to make a statement before I am absolutely sure of the facts." When he told the representative of the *SCIENTIFIC AMERICAN* that in a few months a regular transatlantic wireless telegraph service would be established, he said it in a way that left no doubt of the thing.

Although he is modest, he does not wrong himself by belittling his own work. He talks of his magnetic receiver almost objectively, as if it were the production of some other inventor's mind, which is all the more noteworthy because the instrument in question is, probably, the most valuable contribution to wireless telegraphic apparatus made since the invention of the coherer. He admits his receiver's great speed and its general merit, and expresses his opinion of its recent remarkable performance at Cape Cod in terms of mild approval, which are, however, not utterly devoid of a tinge of pleasure. It is difficult to picture Marconi's waxing enthusiastic even over a very great achievement. It is significant that the newspaper men who saw him after his wonderful feat at Cape Cod merely reported him to be in exceptionally good humor.

He has had unusual obstacles to contend with in the development of his ideas. There have been technical difficulties, of which he is now fortunately able to speak as things of the past. The reason for these difficulties he describes in a simple way without a trace of the pride that he probably feels in having overcome them. "Any other machine," he says, "enables the inventor to shut himself up in a room and announce results when it is wise for him to do so. Wireless telegraphy is different, especially in the way that we labor. It is not a case of one machine here and one in England; but of half a machine here, and another half in England. And each of these machines must be adjusted, the one to the other."

More formidable even than the inherent technical difficulties of space telegraphy itself was the opposition of the British telegraph and cable companies, who thought that their vested interests of $400,000,000 were endangered by the new means of communication. Officials of the telegraph and cable companies have blocked Marconi's onward course wherever they could. Subject to government control as the telegraph systems are, the authorities have been discourteously slow to grant privileges to Marconi. They allowed him to send messages to ships three miles from land, but when the vessels came within the two and one-half mile limit, communication was forbidden. When he is asked to tell something of these trials, he answers, not bitterly as one might expect in a man who has been sometimes balked, but smilingly, in amused toleration, as if the experience was to have been foreseen. He does not gloat over the failure of the companies; he simply says: "I think this opposition has at least been ineffective." If you question him as to the commercial success of his invention, he points for an answer to the sixty English warships, twenty-five Italian warships, and a score of Atlantic liners equipped with his apparatus.

As Marconi himself recognizes the merit of the labors of those who went before him, others should recognize the fact that his organizing talent has brought together a hundred contributory speculations and detached discoveries into harmonious relation, and has given us a system of wireless telegraphy, still susceptible of improvement in many respects, no doubt, but practical in the attainment of results scarcely deemed possible by present agencies.

UNIT 5.

WORLD WIDE WEB (WWW)

I. Read the text.
II. Divide each part of the text into paragraphs.
III. Express the idea of each paragraph in one sentence.
IV. Write a summary of the text in English.

World Wide Web (WWW)

1. Introduction

World Wide Web (WWW) is a computer-based network of information resources that a user can move through by using links from one document to another. The information on the World Wide Web is spread over computers all over the world. The World Wide Web is often referred to simply as "the Web."

The Web has become a very popular resource since it first became possible to view images and other multimedia on the Internet, a worldwide network of computers, in 1993. The Web offers a place where companies, institutions, and individuals can display information about their products, research, or their lives. Anyone with access to a computer connected to the Web can view most of that information. A small percentage of information on the Web is only accessible to

subscribers or other authorized users. The Web has become a forum for many groups and a marketplace for many companies. Museums, libraries, government agencies, and schools make the Web a valuable learning and research tool by posting data and research. The Web also carries information in a wide spectrum of formats. Users can read text, view pictures, listen to sounds, and even explore interactive virtual environments on the Web.

2. A Web of Computers

Like all computer networks, the Web connects two types of computers–clients and servers—using a standard set of rules for communication between the computers. The server computers store the information resources that make up the Web, and Web users use client computers to access the resources. A computer-based network may be a public network—such as the worldwide Internet—or a private network, such as a company's intranet. The Web is part of the Internet. The Internet also encompasses other methods of linking computers, such as Telnet, File Transfer Protocol, and Gopher, but the Web has quickly become the most widely used part of the Internet. It differs from the other parts of the Internet in the rules that computers use to talk to each other and in the accessibility of information other than text. It is much more difficult to view pictures or other multimedia files with methods other than the Web.

Enabling client computers to display Web pages with pictures and other media was made possible by the introduction of a type of software called a *browser*. Each Web document contains coded information about what is on the page, how the page should look, and to which other sites the document links. The browser on the client's computer reads this information and uses it to display the page on the client's screen. Almost every Web page or Web document includes links, called hyperlinks, to other Web sites. Hyperlinks are a defining feature of the Web—they allow users to travel between Web documents without following a specific order or hierarchy.

3. How the Web Works

When users want to access the Web, they use the Web browser on their client computer to connect to a Web server. Client computers connect to the Web in one of two ways. Client computers with dedicated access to the Web connect directly to the Web through a router (a piece of computer hardware that determines the best way to connect client and server computers) or by being part of a larger network with a direct connection to the Web. Client computers with dial-up access to the Web connect to the Web through a modem, a hardware device that translates information from the computer into signals that can travel over telephone lines. Some modems send signals over cable television lines or special high-capacity telephone lines such as Integrated Services Digital Network (ISDN) or Asymmetric Digital Subscriber Loop (ASDL) lines. The client computer and the Web server use a set of rules for passing information back and forth. The Web browser knows another set of rules with which it can open and display information that reaches the client computer.

Web servers hold Web documents and the media associated with them. They can be ordinary personal computers, powerful mainframe computers, or anywhere in the range between the two. Client computers access information from Web servers, and any computer that a person uses to access the Web is a client, so a client could be any type of computer. The set of rules that clients and servers use to talk to each other is called a protocol. The Web, and all Internet formats, uses the protocol called TCP/IP (Transmission Control Protocol/Internet Protocol). However, each part of the Internet—such as the Web, gopher systems, and File Transfer Protocol (FTP) systems—uses a slightly different system to transfer files between clients and servers.

The address of a Web document helps the client computer find and connect to the server that holds the page. The address of a Web page is called a Uniform Resource Locator (URL). A URL is a compound code that tells the client's browser three things: the rules the client should use to reach the site, the Internet address that uniquely designates the server, and the location within the server's file system for a given item. An example of a URL is http://encarta.msn.com/. The first part of the URL, *http://,* shows that the site is on the World Wide Web. Most browsers are also capable of retrieving files with formats from other parts of the Internet, such as gopher and FTP. Other Internet formats use different codes in the first part of their URLs—for example, gopher uses *gopher://* and FTP uses *ftp://.* The next part of the URL, *encarta.msn.com,* gives the name, or unique Internet address, of the server on which the Web site is stored. Some URLs specify certain directories or files, such as http://encarta.msn.com/explore/default.asp—*explore* is the name of the directory in which the file *default.asp* is found.

The Web holds information in many forms, including text, graphical images, and any type of digital media files: including video, audio, and virtual reality files. Some elements of Web pages are actually small software programs in their own right. These objects, called applets (from a small application, another name for a computer program), follow a set of instructions written by the person that programmed the applet. Applets allow users to play games on the Web, search databases, perform virtual scientific experiments, and many other actions.

The codes that tell the browser on the client computer how to display a Web document correspond to a set of rules called Hypertext Markup Language (HTML). Each Web document is written as plain text, and the instructions that tell the client computer how to present the document are contained within the document itself, encoded using special symbols called HTML tags. The browser knows how to interpret the HTML tags, so the document appears on the user's screen as the document designer intended. In addition to HTML, some types of objects on the Web use their own coding. Applets, for example, are mini-computer programs that are written in computer programming languages such as Visual Basic and Java.

Client-server communication, URLs, and HTML allow Web sites to incorporate hyperlinks, which users can use to navigate through the Web. Hyperlinks are often phrases in the text of the Web document that link to another Web document by providing the document's URL when the user clicks their mouse on the phrase. The client's browser usually differentiates between hyperlinks and ordinary text by

making the hyperlinks a different color or by underlining the hyperlinks. Hyperlinks allow users to jump between diverse pages on the Web in no particular order. This method of accessing information is called *associative access,* and scientists believe it bears a striking resemblance to the way the human brain accesses stored information. Hyperlinks make referencing information on the Web faster and easier than using most traditional printed documents.

4. Who Uses the Web

Even though the World Wide Web is only a part of the Internet, surveys have shown that over 75 percent of Internet use is on the Web. That percentage is likely to grow in the future.

One of the most remarkable aspects of the World Wide Web is its users. They are a cross section of society. Users include students who need to find materials for a term paper, physicians who need to find out about the latest medical research, and college applicants investigating campuses or even filling out application and financial aid forms online. Other users include investors who can look up the trading history of a company's stock and evaluate data on various commodities and mutual funds. All of this information is readily available on the Web. Users can often find graphs of a company's financial information that show the information in several different ways.

Travelers investigating a possible trip can take virtual tours, check on airline schedules and fares, and even book a flight on the Web. Many destinations—including parks, cities, resorts, and hotels—have their own Web sites with guides and local maps. Major delivery companies also have Web sites from which customers can track their shipments, finding out where their packages are or when they were delivered.

Government agencies have Web sites where they post regulations, procedures, newsletters, and tax forms. Many elected officials—including almost all members of the United States Congress—have Web sites, where they express their views, list their achievements, and invite input from the voters. The Web also contains directories of e-mail and postal mail addresses and phone numbers.

Many merchants and publishers now do business on the Web. Web users can shop at Web sites of major bookstores, clothing sellers, and other retailers. Many major newspapers have special Web editions that are issued even more frequently than daily. The major broadcast networks use the Web to provide supplementary materials for radio and television shows, especially documentaries. Electronic journals in almost every scholarly field are now on the Web. Most museums now offer the Web user a virtual tour of their exhibits and holdings. These businesses and institutions usually use their Web sites to complement the non-Web parts of the operations. Some receive extra revenues from selling advertising space on their Web sites. Some businesses, especially publishers, provide limited information to ordinary Web users, but offer much more to users who buy a subscription.

5. History

The World Wide Web was developed by British physicist and computer scientist Timothy Berners-Lee as a project within the European Center for Nuclear Energy Research (CERN, now the European Laboratory for Particle Physics) in Geneva, Switzerland. Berners-Lee first began working with hypertext in the early 1980s. His implementation of the Web became operational at CERN in 1989, and it quickly spread to universities in the rest of the world through the high-energy physics community of scholars. Groups at the National Center for Supercomputing Applications at the University of Illinois in Champaign-Urbana also researched and developed Web technology. They developed the first major browser, named Mosaic, in 1993. Mosaic was the first browser to come in several different versions, each of which was designed to run on a different operating system. Operating systems are the basic software that control computers.

The architecture of the Web is amazingly straightforward. For the user, the Web is attractive to use because it is built upon a graphical user interface (GUI), a method of displaying information and controls with pictures. The Web also works on diverse types of computing equipment because it is made up of a small set of programs. This small set makes it relatively simple for programmers to write software that can translate information on the Web into a form that corresponds to a particular operating system. The Web's methods of storing information associatively, retrieving documents with hypertext links, and naming Web sites with URLs make it a smooth extension of the rest of the Internet. This allows easy access to information between different parts of the Internet.

6. Future Trends

People continue to extend and improve on World Wide Web technology. Computer scientists predict that users will likely see at least five new ways in which the Web has been extended: new ways of searching the Web, new ways of restricting access to intellectual property, more integration of entire databases into the Web, more access to software libraries, and more and more electronic commerce.

HTML will probably continue to go through new forms with extended capabilities for formatting Web pages. Other complementary programming and coding systems such as Visual Basic scripting, Virtual Reality Markup Language (VMRL), Active X programming, and Java scripting will probably continue to gain larger roles in the Web. This will result in more powerful Web pages, capable of bringing information to users in more engaging and exiting ways.

On the hardware side, faster connections to the Web will allow users to download more information, making it practical to include more information and more complicated multimedia elements on each Web page. Software, telephone, and cable companies are planning partnerships that will allow information from the Web to travel into homes along improved telephone lines and coaxial cable such as that used for cable television. New kinds of computers, specifically designed for use with the Web, may become increasingly popular. These computers are less expensive than ordinary computers because they have fewer features, retaining only those required

by the Web. Some computers even use ordinary television sets, instead of special computer monitors, to display content from the Web.

UNIT 6.

OFFICE SYSTEMS

I. Read the text.
II. Divide each part of the text into paragraphs.
III. Express the idea of each paragraph in one sentence.
IV. Write a summary of the text in English.

Office Systems

1. Introduction

Office Systems refer to the equipment used to create, store, process, or communicate information in a business environment. This information can be manually, electrically, or electronically produced, duplicated, and transmitted.

The rapid growth of the service sector of the United States economy beginning in the mid-1970s has furnished a new market for sophisticated office automation. With the increasing incorporation of microchips and microcircuitry into office equipment, the line between the computer and other equipment has blurred. Most modern office equipment—including typewriters, dictation equipment, facsimile machines, photocopiers, calculators, and telephone systems as well—contains a microprocessor.

At the same time, computers—either stand-alone or as part of a network—and specialized software programs are taking over tasks such as facsimile transmission or FAX, voice mail, and telecommunications that were once performed by separate pieces of equipment. In fact, the computer has virtually taken the place of typewriters, calculators, and manual accounting techniques and is rapidly taking over graphics design, production scheduling, and engineering design.

2. Document Preparation

Office documents are generally mechanically or electronically produced records: letters, spreadsheets, memos, invoices, and so on. These are produced on a variety of equipment, including typewriters, word processors, and computers, and may be saved on paper or in electronically encoded form.

A. Typewriters

In use since the 1870s, the manual typewriter has all but disappeared from the modern office, having been replaced by the electric typewriter, electronic typewriter, dedicated word processor, and computer-based word-processing software program. The electric typewriter uses either individually molded metal characters or a rotating ball with raised characters that strike a sheet of paper through an inked or coated ribbon to create an impression of the character on paper. Many electric typewriters

have a separate ribbon segment that removes the impression from the paper, permitting the user to erase text.

Electric typewriters have been supplanted, in turn, by electronic typewriters equipped with internal memory capable of storing anything from a few lines of text to more than 40,000 characters. This memory capability makes it possible for a user to produce many copies of the same letter with different addresses and salutations. A hybrid between electric typewriters and computers, electronic typewriters—which contain a microprocessor—can automatically center headings, align decimal points in numerical tables, and flag words that are not found in the "spellcheck" memory. Most electronic typewriters also permit rudimentary editing of text before printing, through the use of a small liquid crystal display window.

B. Word Processors

In the early 1980s, dedicated word processors—computers designed solely for word processing—became common. As with word-processing software designed for personal computers, dedicated word processors feature multiple editorial functions that facilitate manipulation of text, including the ability to insert new text at any point in a document, delete text, "cut and paste" (move blocks of text to a new location within the same document or to another document), and search for and replace portions of text—enabling users to make multiple changes in a document without extensive retyping. In addition, word-processing software may incorporate a type-composition function and a page-layout function, enabling the user to electronically design and lay out a printed page—key features of desktop publishing. Word-processor text can be stored on a magnetic disk or other medium for later use and may be transmitted to a printer to produce a document on paper, or "hard copy."

C. Computers

During the first half of the 20th century, financial and other numerical record-keeping tasks were performed manually or by bookkeeping machines, billing machines, tabulating equipment, and other types of electromechanical accounting devices. In the 1950s, such machines were increasingly replaced by mainframe computers—large, very expensive, high-speed machines that require trained operators as well as a special temperature-regulated facility to prevent overheating. Use of these machines today is limited to large organizations with heavy-volume data-processing requirements. Time-sharing—allowing more than one company to use the same mainframe for a fee—was instituted to divide the cost of the equipment among several users while ensuring that the equipment is utilized to the maximum extent.

Mainframes with remote terminals, each with its own monitor, became available in the mid-1970s and allowed for simultaneous input by many users. With the advent of the minicomputer, however, a far less expensive alternative became available. The transistor and microelectronics made manufacture of these smaller, less-complex machines practicable. Minicomputers, the first of which entered general business use in the early 1960s, are now widespread in commerce and government.

Terminals linked to the central processing unit (CPU) are under the direct control of the individual user rather than centralized staff. In recent years, however, it is the microcomputer, or personal computer (PC), that has come to play the principal role in most office workplaces.

Desktop PCs have become increasingly affordable as a result of industry-wide adoption of the architecture of the PC introduced in 1981. Although it has become feasible to provide virtually every office worker with a PC, it is more cost-effective for PC users to share files and common peripherals such as printers, facsimile boards, modems, and scanners. In the late 1980s and early 1990s, many companies began programs of linking or "networking" multiple PCs into a unified system.

The local area network (LAN) was created in response to the need for a standardized system of linking computers together in a company. The most common method used to connect computers to a network is by means of coaxial cables. Newer-generation networks use optical fiber connections. When computers are not in close physical proximity, networks may use microwave radio or infrared radiation to link the computers. Microwave radio requires a dish antenna for transmission and reception; infrared radiation requires a lens for transmission and a mirror and lens for reception. Other methods used for wide-area networking include telephone and communications-satellite linkage.

The need for computer "connectivity" has established the usefulness of the peripheral device known as the modem. Modems permit two computers to communicate by telephone in order to access databases, transmit files, upload and download facsimile transmissions, and send and receive electronic mail. Early transmission speeds using this equipment were relatively slow—300 baud. Some modems now operate at speeds of more than 50,000 baud and have error-checking and data-compression features.

Text materials in typed or printed form can be input directly into a computer by means of a scanner. To read text, optical character recognition (OCR) software must first be used to convert printed documents electronically into computer-readable files. Scanners obviate the need to rekey printed text in order to input it; they can also be used to input graphic material.

D. Dictation Equipment

Dictation units use a microphone and record/playback device to input speech electronically for storage on a magnetic tape or other magnetic media to be used later for transcription by typists. The equipment commonly includes a foot-actuated control that enables typists to stop, reverse, fast forward, or play a recording while their hands remain free to operate a keyboard.

3. Document Reproduction and Storage

Office machines for the full-size reproduction of documents can be divided into two groups: copiers designed to make one or several reproductions, and duplicators designed to make many copies. Companies still store paper documents in

file cabinets of various types, but many documents today are stored electronically or on film.

A. Copiers and Printers

Most modern copiers are electrostatic devices in which document images are created by means of electrical charges and powdered ink, or toner, particles. In the electrophotographic process, the most common photocopying method, a mirror image of a printed paged is induced electrostatically onto a metal cylinder from which it is transferred to a sheet of plain paper. Copier speeds range from a few pages per minute to more than 1.5 pages per second. Advanced devices are equipped with automatic feeders, collators, and staplers. Some machines can copy both sides of a document automatically, reduce or enlarge the image, and reproduce color documents in color.

Instead of electrostatic technology, some duplicators employ offset lithography, in which a specially prepared master is used to produce multiple copies. Offset printing, using small presses, is the printing process most often used in modern business offices, usually in large organizations that have a central printing department with trained personnel.

Other, once-common copying and duplicating processes retain a very limited role in the contemporary business office, but may still be found in some schools and other institutions. In spirit duplication, a paper master bearing images formed from carbon dye is moistened with an alcohol solution, dissolving some of the dye, which is then deposited on a piece of paper. This process is repeated rapidly to print multiple copies. In mimeography, a stencil-like master is created by typing or otherwise removing an ink-impervious coating from a fibrous tissue. The master is mounted on a cylinder that forces ink through the stencil onto paper. The diazo process, using ammonia-sensitive paper, is still used in engineering and architectural offices to reproduce graphics at scales that can only be accommodated on large sheets of paper.

B. Computer Printers

A considerable volume of office computer output is via the printer. Among the earliest printers used with PCs in business offices were daisy-wheel and thimble printers, so-called because of the shape of their printing elements. Although their type quality was comparable to that of a typewriter, they were slow and could accommodate only text, not graphic materials. As a result, they have been supplanted in most offices by dot-matrix, ink-jet, and laser printers. The dot-matrix printer may have a 9- or 24-pin print head. The pins impact the paper through a ribbon, creating patterns of dots in the shape of letters and numbers in multiple fonts and type sizes. The ink-jet printer, an advance over the dot-matrix, provides both high resolution (the higher the resolution, the better the print quality) and quiet operation. The laser printer represents an even greater advance. Similar in technology to a photocopier, it offers speed, high resolution of 300 dots or more per inch, ability to reproduce

complex graphics, and silent operation—all of which make it virtually essential for desktop publishing.

C. Microfilm/Microfiche

Although computer-generated documents are usually stored as files on magnetic tape or disks, both computer documents and paper documents may also be stored on microfilm or microfiche. The space needed for document storage is reduced, and handling and retrieval are simplified by use of microfilm equipment, which photographically reduces images, producing miniature transparencies that can then be magnified for viewing or printing.

4. Communications

With facsimile transmission, or FAX, the dark and light areas on text or graphic material are digitized, or converted into a series of electrical pulses corresponding to a digital code. At the receiving site, the incoming signal is reconstructed to produce a facsimile of the transmitted information. Special types of FAX equipment can transmit microfilm images to remote locations for reconstruction as microfilm or paper copies.

Telex, a system of direct-dial teleprinter exchange, and Teletypewriter Exchange (TWX) are well-established examples of electronic mail technology. TWX is customarily used within North America, and Telex for international message transmission. In either case, a message is entered at a typewriterlike terminal for transmission over a network of telegraph lines to a designated compatible receiver that prints the message onto paper. An operator need not be present at the receiver. Some word processors can also prepare messages for transmission to TWX or Telex terminals or to other word processors. Computer-based electronic message systems are an alternative to telephonic communications or conventional interoffice memoranda.

A. Electronic mail (e-mail)

E-mail has become a key part of the communications networks of most modern offices. Data and messages can be transmitted from one computer to another using telephone lines, microwave links, communications satellites, or other telecommunications equipment. The same message can be sent to a number of different addresses. E-mail is sent through a company's own local area network or beyond, through a nationwide or worldwide communications network. E-mail services use a central computer to store messages and data and to route them to their intended destination. With a subscription to a public e-mail network, an individual PC user needs only a modem and a telephone to send and receive written or vocal messages. Because of the huge amount of e-mail that can be generated, systems have been developed to screen mail for individual users.

A specialized type of e-mail system, voice mail, is a relatively simple, computer-linked technology for recording, storing, retrieving, and forwarding phone messages. It is called voice mail, or voice-messaging, because the messages are spoken and left

in a "voice mailbox." The telephone doubles as a computer terminal, but instead of presenting the information on a computer screen, the system reads it over the phone line, using prerecorded voice vocabulary. The systems are based on special-purpose computer chips and software that convert human speech into bits of digital code. These digitized voices are stored on magnetic disks, from which they can be instantaneously retrieved. Callers are offered a menu of choices, and the messages they select are played; they can leave messages in "voice mailboxes," or they can access huge computer databases.

B. Telecommuting

All of the electronic links among the people in a modern office can be extended beyond the building walls to workers at home or in satellite offices. This capability has led to a sharp increase in telecommuting. In 1991 an estimated 5.5 million U.S. workers worked at least part of the time outside the main office, a 38 percent increase over 1990. Managers and professional employees were the major participants in this trend. Early reports of increased productivity among people who no longer spent hours traveling from home to office indicated that further increases in telecommuting were likely.

5. Other Advances in Automation

Although some purely mechanical devices remain in use, the newest models of many machines contain electronic components. These devices include mail-handling equipment (postage meters, scales, letter-opening machines, folding and inserting machines); automatic addressing equipment; audio paging systems; paper cutters, binders, and staplers; time-recording machines; and coin-sorting, counting, wrapping, and related money-handling equipment.

Electronic calculators, both hand-held and desktop devices, have virtually replaced older, strictly mechanical adding machines. Electronic calculators are built around a CPU and incorporate a display unit, such as a liquid-crystal display; a keyboard; and, in some models, a paper-printing function. Calculators designed for statistical, engineering, and scientific tasks are programmed to perform predetermined sequences of mathematical operations automatically.

Computerization of automated machines is widespread in both commerce and science. By the late 1980s, fully automated mail delivery machines were being used in very large offices. Early robots used four different sensor systems simultaneously: video cameras, both ultrasound and infrared sensors, and inertial guidance. Some are guided by magnetic wires embedded in the floor. Other robots now travel about 100 ft (about 30 m) along a virtually invisible guide-path painted onto the floor and tracked by photoelectric sensors. Stops and other directions are encoded in the guide-path. This new technology increases the frequency of mail delivery and eliminates most of the need for central collection and redistribution.