Chapter 4: Communication Technology

Solutions

Summative Assessment

Multiple-Choice Questions (MCQs)

1. Two examples of network are telephone and ..... .
   a. Radio b. Transmission
   c. Globe d. All of the above

Ans. a

2. ..... is a group of interconnected networks.
   a. Internet b. Computer
   c. Hardware d. Satellite

Ans. a

3. ..... is also known as the discrete signal.
   a. Digital signal b. Analog signal
   c. Continuous signal d. None of the above

Ans. a

4. ..... is the version of twisted cable created by IBM.
   a. STP cable b. UTP cable
   c. Coaxial cable d. None of the above

Ans. a

Very Short Answer Questions

5. Why do we use transmission media?

Ans. The transmission media is a medium that enables the user to transfer data from one computer to another.

6. List the types of modem.

Ans. There are two types of modems:
- External modem
- Internal modem

7. What is unguided media?

Ans. The unguided transmission media (also known as wireless media) use waves to transfer data.

8. Define WAN.

Ans. WAN is a type of network used to cover a wide geographical area or region.

9. What is InterSpace?

Ans. InterSpace is a client/server program that allows multiple users to communicate online with real-time audio, video, and text chat in dynamic 3D environments.

10. Define data with an example.

Ans. Data is defined as raw facts and figures, such as "Sunita","is", "25", "years", "old" that does not have any meaning.

11. Define information with an example.

Ans. Information refers to the processed data that makes some logical meaning. For example, Sunita and 25 are raw pieces of data, which when processed give the information 'Sunita is 25 years old.'

12. What is multimedia?

Ans. Multimedia is defined as the combination of text, graphics, sound, special effects, and animation.

13. What is the measuring unit of a modem?

Ans. The measuring unit of a modem is bits per second (bps).

Short Answer Questions

14. What is the difference between guided and unguided media?

Ans. The main difference between guided and unguided media is that guided media transmit data through cables; whereas, unguided media uses waves to connect computers for transferring data.

15. Differentiate between long distance wireless media and short distance wireless media.

Ans. The long-distance wireless media supports communication over a large distance. This distance is up to thousands of kilometers; whereas, the short-distance wireless media allows communication over a small distance, such as a few meters to a few kilometers.

16. Define Internet and its usage in day-to-day life.

Ans. Internet is a collection of an infinite number of computers spread across the world. Individuals use the Internet for communicating with their friends through e-mail, social networking websites and chats, entertainment (games and music), searching information and also for online shopping. The Internet can also be used to access information about difficult subjects.

17. Describe the components of a computer network.

Ans. The various components in the computer network are:
- The Sender
- Communication equipment at the sender side (Modem)
- Communication channel (telephone lines)
- The Receiver
- Communication equipment at the receiver side (Modem)

18. Differentiate between LAN, MAN and WAN.

Ans.

- **LAN:** LAN is a localized network that is used to connect a computer with other computers or hardware, such as a printer. This type of network is useful when the user want to connect two different departments in a building.
- **MAN:** MAN is a bigger version of LAN and its technology is also similar to LAN. MAN covers an area that is larger than the area covered by LAN but smaller than the area covered by WAN.
- **WAN:** WAN is a type of network that is used to cover a wide geographical area or region. WAN links different metropolitans, countries, and national boundaries.

Long Answer Questions

19. Define network using a diagram.

Ans. A network is defined as a collection of devices connected together. In a computer network, computers are connected using communication media (cables and wireless) through which data is transferred in the form of signals. A computer network is a group of two or more computers that are linked with each other so as to:

- Share files with other computers in the network
- Share resources, such as printers, hard disks and fax machines
- Share application software (such as MS Office) over the network
- Allow electronic communication (such as e-mail, messaging, etc.)

A diagrammatic representation of various devices connected to each other forming a network is shown in Figure 1:

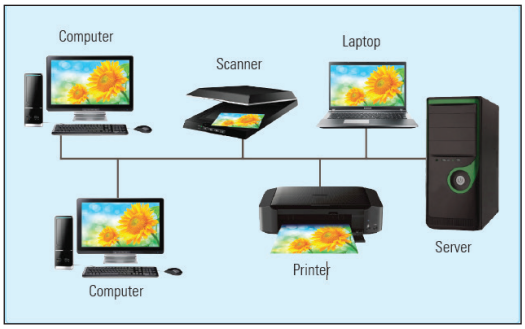

Figure 1: Joining Resources to form a Network

20. Explain the need of establishing a computer network.

Ans. Computers have become an important part of our lives. We use computers to exchange information in our day-to-day life using different media, such as cables and satellites. Information that would have otherwise taken days to reach us can now be read or heard in minutes. All this is possible due to networking. The need of establishing a computer network is as follows:

- It allows the user to share all types of data, such as text, audio, video, pictures and graphics
- It reduces cost by sharing hardware and software resources
- It saves time by transferring data from one computer to others
- It provides high reliability because there are multiple sources of supply
- It increases productivity by easily sharing data

21. What is the use of computer network?

Ans. Computers in a computer network are connected by communication media through which data is transferred in the form of signals. In other words, a network is defined as a collection of devices connected together. A computer network is a group of two or more computers (interconnected computers) that are linked to each other so as to:

- Share files with other computers in the network
- Share resources, such as printers, hard disks, and fax machines over the network
- Share application software (such as MS Office) over the network
- Allow electronic communication (such as e-mail, chatting, etc.)

22. Explain the following terms:

- Cat6
- NFC

Ans. **Category 6 (Cat6):** It is a twisted pair cable that consists of four pairs of twisted copper wires. The maximum length of a Cat6 cable is around 55 meters. It offers a bandwidth up to 250 MHz and can support 10GBASE-T(Gigabit Ethernet). As compared to Cat5e cables, Cat6 cables are more expensive, rigid and have less interference.

- **NFC or Near Field Communication:** It is a technology that facilitates wireless communication between devices like smartphones and tablets. NFC uses radio frequency identification (RFID) signals to transfer small amounts of data between two devices. It is a short range wireless link that consumes very less power (even less than that of a smartphone's battery). In fact, NFC is activated only when the devices are touched or brought very close to each other (within 4 cm). Unlike Bluetooth, no pairing of devices is required in NFC, making it very easy to use.

23. How does a communication channel help in networking?

Ans. The communication channel is one of the various components of a network. A communication channel is a medium that carries information and transfer it from one computer to another over the network. The communication channel can be categorized into two categories: guided and unguided. The guided communication channel is referred as physical cable that is used for connecting computers in a network. It also allows users to transfer information between computers in the network. Commonly used guided communication channels in a network are twisted pair cables, coaxial cables, and fiber optic cables. In addition to guided communication channel, unguided communication channel allows communication between computers in a network with the use of waves. There is no need for physical cables in an unguided communication. Commonly used unguided communication channels are microwaves, infrared waves, and radio waves.

24. Define the working of a modem.

Ans. Modem is a device, which is used to transmit data over a network. In a network, while computers are communicating, a computer from the sender side sends data in binary code to a modem. The modem at the sender side converts the binary-coded data into analog signals. Then, these signals travel along the telephone

network. When the data reaches the destination computer, the modem connected to that computer converts the analog signals back into binary-coded data, which can be read by the computer.

The working of a modem is depicted in Figure 2:

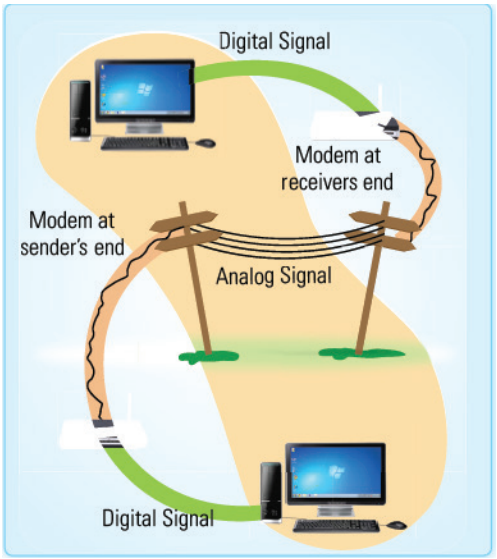

Figure 2: Working of Modem

25. Explain various types of cables used for connecting computers.

Ans. The various types of networking cables used for connecting computers are as follows:

- **The Twisted Pair Cable:** It contains twisted wires that use copper as a conductor. These wires have plastic insulation and are twisted. The cable wires are twisted to provide protection against crosstalk and noise.
- **The Coaxial Cable:** It consists of two conductors. The first conductor is the inner conductor of solid copper (also called the core conductor). The second conductor is the outer conductor. The outer conductor serves as a shield against noise. There is an insulating plastic between the conductors and the whole cable is covered with a plastic jacket.
- **The Fiber Optic Cable:** It is a type of cable that contains one or more optical fibers coated with plastic layers. Due to their greater bandwidth, these cables can carry more data. These cables are thinner and lighter than metallic cables. The main disadvantage of this type of cable is that it is very expensive to install.

26. Define Bluetooth. Explain its usage in real life.

Ans. Bluetooth refers to a wireless technology that creates small wireless networks, called personal area networks **(PANs)** between personal computers and peripheral devices. For example connecting the mobile phone with the computer.

The Bluetooth wireless technology enables the user to establish a wireless communication between any two Bluetooth devices, such as mobile phones, laptops, cameras, or modem stations without any cables. The data transfer rate over the Bluetooth varies from 723 Kbps to 1 Mbps in a short range (the maximum range is 10 meters). The personal area network (PAN) created by Bluetooth is sometimes called a piconet. Up to 255 Bluetooth devices can participate in a piconet at one time. For example, a user can transfer data from the mobile phone to a laptop by connecting them via Bluetooth.

27. What is the difference between digital signal and analog signal?

Ans. A digital signal is defined as a signal that is in the form of a string of bits formed by the conversion of the original information. On the other hand, an analog signal is defined as a signal in which signal values increase and decrease in the same way as they are being transferred. A digital signal is a discrete signal; while an analog signal is a continuous signal. The modem at the sender side converts the digital signals generated by a computer into analog signals and then transmits them to the selected user (computer) over the telephone line.

28. Which communication channel is used when two people are sitting together and talking to each other? Explain.

Ans. In a conversation between two persons, one is the speaker and other is the listener. The person who is speaking is known as the sender and the person who is listening is known as the receiver. While these persons are communicating, notice how the voice or information is transferred from one person to another. The voice or information is transferred through the air. In other words, air acts as a transmission media or communication channel. A communication channel is a medium that carries information from one place to another.

The three components of a face-to-face communication are:

- Sender
- Communication channel (air)
- Receiver

29. What do you understand by the terms 'online' and 'offline' in network?

Ans. The terms 'online' and 'offline' have different meanings in computer technology. Online term signifies a state of connectivity, whereas offline term signifies a disconnected state. In an online environment, computers located at different demographic regions are connected to each other to form a network. This allows instantaneous transmission of data and information across the globe. In other words, when a computer is turned on and is able to access the network, it is said to be online and if it is unable to access the network, it is offline.

One example of a common use of these terms is Microsoft Outlook. When online it will try to make a connection to mail servers at regular time intervals but when it is offline it will not make any attempt for such connection.

30. As we know that there are two types of media, namely guided and unguided that are used to transmit information. Explain which transmission media is good to use and why?

Ans. The guided media use cables or wires to connect computers in a network; whereas, unguided media use waves (through the atmosphere or space).

In guided media, data is transmitted through cables. The various types of networking cables used in guided media are

twisted pair cable, coaxial cable , fiber optic cable. Unguided transmission media use waves to transfer data. Unguided media allow transmission without any physical means (cables) to define the path of transmission. So this media is best when the data transmission through the networking cable is not possible. Unguided transmission media are categorized into two types, namely long distance wireless media and short distance wireless media.

Formative Assessment

Application-Oriented Questions

1. While forming a computer network, various computers are connected with each other using some form of media.
   a. What do we call this media?
   b. What does this media work?
   c. How many types of such media are available?

Ans. a. Transmission media
b. The transmission media is a medium that enables users to transfer data from one computer to another.c. Two types of media: guided and unguided

2. Three friends have decided to start a company that deals with computer parts. They hire some people and allot a computer to each of them. The work is going smoothly, but the head of the organization notice that the productivity of employees is not increasing. They try to find out the reason and come to know that when an employee needs any kind of information from other employee, he/she has to approach that employee personally to get the information. To overcome this situation, they have decided to form a network in their organization.
   a. What type of network do they need to use in their organization?
   b. What are the characteristics of the selected network types?
   c. Why do they select this particular network type?

Ans. a. LAN
b. LAN helps in resource sharing, for example, data, software, and hardware. LAN transfers data at a high speed. The data transfer rate for LAN technologies is up to 1000 Mbps.
c. They have selected the LAN network, as this network is useful when the user wants to connect two different departments in a building.

3. Can only computers be connected through a network? If no, then explain what other tasks can be performed through a network.

Ans. Some other tasks that can be performed through a network are as follows:
- Telephone networking
- Cable TV networking
- Radio broadcasting

4. Two persons are sitting in front of each other and gossiping. In this case, explain the following things:
   a. What will be the form of ideas, information, or messages that are transferred?
   b. Which media is used to transfer the information?
   c. Can you explain the same situation with some changes?

Ans. a. The ideas or information or messages are transferred through voice.
b. The media involved is air.
c. Two persons are communicating by using a telephone.

5. Try to connect computers using a modem. After this, explain how does a modem work?

Ans. When computers are connected through telephone, an additional device is used that is known as modem. A modem converts the signals generated by a computer and facilitates their transmission over telephone lines. The modem at the sender's side converts the signals into analog signals and then transmits them to the selected user (computer) over the telephone line. The modem at the receiver's side receives the signals and converts them into signals that are understandable by the computer.

6. The head of an organization decides to form a network using the guided media. In the guided media, one can connect various computers using cables. In such a situation, the problem is that he/she does not have much knowledge about the networking cables.
   a. Explain him/her briefly about the networking cable and its types.
   b. After understanding about the networking cables and its types, select a cable that you want to use to connect the computer in your organization. Give reasons that why are you selecting that particular cable.

Ans. a. Networking cables are used to connect computers in a network.
The various types of networking cables are defined as follows:
- **The Twisted Pair Cable**: It contains twisted wires that use copper as a conductor. These wires have plastic insulation and are twisted. The cable wires are twisted to provide protection against crosstalk and noise.
- **The Coaxial Cable**: It consists of two conductors. The first conductor is the inner conductor of solid copper (also called the core conductor). The second conductor is the outer conductor. The outer conductor serves as a shield against noise. There is an insulating plastic between the conductors and the whole cable is covered with a plastic jacket.
- **The Fiber Optic Cable**: A fiber optic cable consists of a narrow strand of glass, called the core, around which a concentric layer of glass is present, which is known as cladding. This type of cable contains one or more optical fibers, which are coated with plastic layers. Due to their greater bandwidth, these cables can carry more data.

b. I would use the fiber optic cable because of its greater bandwidth.

7. Suppose you are appointed as a system administrator in an organization. The organization has several offices within the range of 10 km and 100 km. As a system administrator, which network type would you prefer to connect these offices and why?

Ans. MAN, because it covers an area between 10 km and 100 km. It can cover a larger area than LAN, but smaller than WAN.

8. In a small organization where twenty people are working, the HOD decides to install a network.

However, he is unable to decide whether to install the network by using the guided media or unguided media. Solve his problem by explaining the meaning and advantages of both guided and unguided media.

Ans. The HOD must use guided media, as the network is required for the small organization. Guided media are the media that uses some physical medium (cables) for connecting computers in the network; whereas unguided media uses waves.

9. An organization has offices in four different cities: Delhi, Mumbai, Kolkata and Chennai. The HOD decides to connect all these offices through a network; however, he does not know which type of network should be used. Explain him the difference between LAN, MAN and WAN, as per the geographical areas that they cover as well as their speed and error in transmission rate.

Ans. LAN is used to transfer data at a high speed within the range of less than 10 km. It is a fault-tolerant data network. MAN covers the distance of 10 km to 100 km and operates at a speed of 1.5 to 150 Mbps. On the other hand, WAN exists in an unlimited geographical area and is more susceptible to errors due to the distances involved.