Chapter 8 Answers

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| **Num** | **Multiple Choice Answers (Book)** | **Matching Answers (Book)** |
| 1 | A | B |
| 2 | A | I |
| 3 | A | D |
| 4 | D | A |
| 5 | B | H |
| 6 | A | F |
| 7 | B | E |
| 8 | B | J |
| 9 | A | G |
| 10 | A | C |

**Open Ended Questions:**

1. **Define communications including connectivity, the wireless revolution, and communication systems.**

* **Communications** is the process of sharing data, programs, and information between two or more computers.
* **Connectivity** is a concept related to using computer networks to link people and resources. For example, connectivity means that you can connect your personal computer to other computers and information sources almost anywhere. With this connection, you are linked to the world of larger computers and the Internet.
* **Wireless revolution** - The single most dramatic change in connectivity and communications in the past few years has been the widespread use of mobile devices like smartphones and tablet PCs with wireless Internet connectivity.
* **Communication systems** are electronic systems that transmit data from one location to another. Four basic elements of a communication system include:
* Sending and receiving devices - originate (send) as well as accept (receive) messages in the form of data, information, and/or instructions.
* Connection devices - convert outgoing messages into packets that can travel across the communication channel and reverse the process for incoming messages.
* Communication channel – transmission medium that carries the message. Medium can be a physical wire or cable, or it can be wireless.
* Data transmission specifications - rules and procedures that coordinate the sending and receiving devices by physically defining how the message will be sent across the communication channel.

1. **Discuss communication channels including physical connections (twisted-pair, coaxial, and fiber-optic cable) and wireless connections (Bluetooth, WiFi, microwave, WiMax, LTE, satellite, and infrared).**

* **Communications Channels**
* Actually carry the data from one computer to another.
* Two categories of communication channels that connect sending and receiving devices include physical and wireless connection
* **Physical Connections- a solid medium to connect sending and receiving devices. These connections include:**
* Twisted pair – pairs of copper wires twisted together
* Standard telephone lines, Ethernet cables
* Ethernet cables are often used in networks and to connect a variety of components to the system unit.
* Coaxial cable - a high-frequency transmission cable consisting of a single, solid copper core.
* Used to deliver television signals as well as to connect computers in a network
* Fiber-optic cable - transmits data as pulses of light through tiny tubes of glass.
* Compared to coaxial cable, it is lighter, faster, and more reliable at transmitting data.
* Rapidly replacing twisted-pair cable telephone lines.
* **Wireless Connections**
* Do not use a solid substance to connect sending and receiving devices. Data is moved through the air. Primary technologies used for wireless connections are Bluetooth, Wi-Fi, microwave, WiMax, LTE, and satellite connections.
* **Bluetooth** is a short-range radio communication standard that transmits data over short distances of up to approximately 33 feet. Bluetooth is widely used for wireless headsets, printer connections, and handheld devices.
* **Wi-Fi (wireless fidelity)** uses high frequency radio signals to transmit data. A number of standards for Wi-Fi exist, and each can send and receive data at a different speed. Most home and business wireless networks use Wi-Fi.
* **Microwave** - communication through high-frequency radio waves. It is sometimes referred to as line-of-sight communication because microwaves can only travel in a straight line.
* Because waves cannot bend with the curvature of the earth they can only be transmitted over relatively short distances.
* For longer distances, the waves must be relayed by means of microwave stations with microwave dishes or antennas.
* **WiMax (Worldwide Interoperability for Microwave Access**) is a new standard that extends the range of Wi-Fi networks using microwave connections. WiMax is commonly used by universities and others to extend the capability of existing Wi-Fi networks.
* **LTE (Long Term Evolution**) is one of the newest wireless standards. Currently, LTE and WiMax connections provide similar performance. LTE, however, promises to provide greater speed and quality transmissions in the near future.
* **Satellite -** amplified microwaves that use point-to-point communication to relay devices (satellites) orbiting 22,000 miles above the earth.
* Rotate at a precise point and speed above the earth.
* Amplify and relay microwave signals from one transmitter on the ground to another.
* Used to send and receive large volumes of data.
* Communication interferences can occur in bad weather.
* Used by global positioning system (GPS) devices.
* Used by many smartphones, including the Apple iPhone.

1. **Discuss connection devices including modems (telephone, DSL, cable, and wireless modems) and connection services (DSL, ADSL, cable, satellite, and cellular connection services).**

* **Connection Devices**
* At one time nearly all computer communication used telephone lines.
* Telephones typically send and receive analog signals, which are continuous electronic waves.
* Computers send and receive digital signals.
* To convert the digital signals to analog signals and vice versa, you need a modem.
* **Modems (modulator-demodulator)**
* Modems convert the computer’s digital signal to an analog transmission to send over the phone line (modulation) and then re-convert it to digital when receiving information from the phone lines (demodulation).
* Transfer rate is in bits-per-second; typically measured in millions of bits (megabits) per second (Mbps)
* Four commonly used types of modems include:
* **Telephone** – used to connect a computer directly to a telephone line
* **DSL** (digital subscriber line) – uses standard phone lines to create a high-speed connection directly to the phone company’s offices
* **Cable** – uses the same coaxial cable as a television to create a high-speed connection.
* **Wireless** (also known as a WWAN- wireless wide area network modem). Commonly a USB or ExpressCard device that provides very portable high-speed connectivity from virtually anywhere.
* **Connection service**
* **Digital subscriber line (DSL)** – is provided by telephone companies using existing telephone lines to provide high-speed connections. **ADSL (asymmetric digital subscriber line)** is one of the most widely used types of DSL.
* **Cable** – is provided by cable television companies using existing television cables to provide high-speed connections, faster than DSL.
* **Satellite** connection services - use satellites to provide wireless connections. Slower than DSL and cable modem but higher availability.
* **Cellular** services - **Cellular service providers** including Verizon, at&t, Sprint, and t-Mobile support voice and data transmission to wireless devices. Cellular services have gone through different generations.
* **1g (first generation mobile telecommunications)** started in the 1980s using analog radio signals to provide analog voice transmission service.
* **2g (second generation mobile telecommunications)** stared in the 1990s using digital radio signals. This generation focused on voice transmission and was too slow for effective Internet connectivity.
* **3g (third generation mobile telecommunications**) started in the 2000s providing services capable of effective connectivity to the Internet and marked the beginning of smartphones.
* While **4g** (**fourth generation mobile telecommunications**) has been widely marketed by several cellular services, not everyone acknowledges that this generation has begun. Most experts, however, do acknowledge that 4g has entered into its infancy with providers using WiMax and LTE connections to provide faster transmission speeds. While current speeds are only marginally faster than 3g, 4g technologies promise to provide speeds up to 10 times faster than 3g in the near future.

1. **Discuss data transmission including bandwidths (voiceband, medium band, broadband, and baseband) as well as protocols (IP addresses, domain name servers, and packetization)**

* **Data transmission**
* Several factors affect how data is transmitted. These factors include bandwidth and protocols.
* **Bandwidth** - a measurement of the width or capacity of the communication channel. It means how much information can move across the communication channel in a given amount of time. Four categories of bandwidth include:
* **Voiceband** (low bandwidth) - used for standard telephone communication by computers with telephone modems and dial-up service.
* **Medium band** - used in special leased lines to connect minicomputers and mainframes as well as to transmit data over long distances. Capable of very high-speed data transfer.
* **Broadband** – widely used by DSL, cable, and satellite connections for high-capacity transmissions. Several users can simultaneously use a single broadband connection for high-speed data transfer.
* **Baseband** - widely used to connect individual computers that are located close to one another. Like broadband, it is able to support high-speed transmission. Unlike broadband, however, baseband can only carry a single signal at one time.
* **Protocols** - For data transmission to be successful, sending and receiving devices must follow a set of communications rules for exchange of information. Protocols are the rules for exchanging data between computers.
* http or hypertext transfer protocol is a widely used protocol used for Web traffic. Another protocol, https or hypertext Transfer Protocol Secure is becoming widely used to protect the transfer of sensitive information. **TCP/IP – Transmission Control Protocol/Internet Protocol** is the standard protocol for the Internet.
* Essential features involve – sending and receiving devices and breaking information into small parts for transmission across the Internet
* Identification: Every computer on the Internet has a unique numeric address called an IP address (Internet Protocol address). Uses a domain name server (DNS) that automatically converts text-based addresses to numeric IP addresses.
* Packetization: Information sent or transmitted across the Internet usually travels through numerous interconnected networks. Before a message is sent, it is reformatted or broken down into small parts called packets. Each packet is then sent separately over the Internet, possible travelling different routes to one common destination. At the receiving end, the packets are reassembled into the correct order.

1. **Discuss networks by identifying and defining specialized terms that describe computer networks.**

* **Networks**
* A computer network is a communication system that connects two or more computers so they can exchange information and share resources.
* **Node**—any device that is connected to a network.
* **Client** —a node that requests and uses resources available from other nodes.
* **Server**—a node that shares resources with other nodes.
* **Directory server**—specialized server that manages resources such as user accounts for an entire network.
* **Host**—any computer system that can be accessed over a network.
* **Router**—a node that forwards or routes data packets from one network to their destination in another network.
* **Switch**—central node that coordinates the flow of data by sending messages directly between sender and receiver nodes. A hub previously filled this purpose; older, less efficient type of switch.
* **Network interface cards (NIC)**— expansion cards located within the system unit that connect the computer to a network.
* **Network operating systems (NOS)**—control and coordinate the activities of all computers and other devices on a network.
* **Network administrator**—a computer specialist responsible for efficient network operations and implementation of new networks.

1. **Discuss network types including local area, home, wireless, personal, metropolitan, and wide area networks.**

* **Network Types**
* **Local Area Networks (LAN)** - Networks with nodes that are in close physical proximity, typically spanning less than a mile and are owned and operated by individual organizations.
* **Network gateway** - device that allows one LAN to be linked to other LANs or to larger networks.
* The most common standard in which nodes in a LAN can be connected to one another is known as **Ethernet**.
* **Home Networks** - networks being used by individuals in their homes and apartments. Allow different computers to share resources, including a common Internet connection
* **Wireless LAN (WLAN)** - uses radio frequencies to connect computers and other devices. All communications pass through the network’s centrally located **wireless access point** or **base station**. This access point interprets incoming radio frequencies and routes communications to the appropriate devices. In public places wireless access points are known as **hotspots** and typically use Wi-Fi technology.
* **Personal area network (PAN)** - type of wireless network that works within a very small area—your immediate surroundings. PANs connect cell phones to headsets, PDAs to other PDAs, keyboards to cell phones, and so on. Most popular PAN technology is Bluetooth, with a maximum range of around 30 feet. Virtually all wireless peripheral devices available today use Bluetooth, including the controllers on popular game systems like the PlayStation and Wii.
* **Metropolitan Area Networks (MAN)** - span distances up to 100 miles. Frequently used links between office buildings that are located throughout a city. MANs are typically owned by a group of organizations who jointly own and operate the network or by a single network service provider who provides network services for a fee.
* **Wide Area Networks** - countrywide and worldwide networks. Provide access to regional service (MAN) providers and typically span distances greater than 100 miles. They use microwave relays and satellites to reach users over long distances

1. **Define network architecture including topologies (bus, ring, star, tree, and mesh) and strategies (client/server and peer-to-peer).**

* **Network Architecture**
  + Describes how a network is arranged and how resources are coordinated and shared.
  + **Topology –** Describes the physical arrangement of a networkand how resources are coordinated and shared.
    - **Bus network** 
      * Each device is connected to a common cable called a bus or backbone and all communications travel along this bus.
    - **Ring network**
      * Each device is connected to two other devices, forming a ring. When a message is sent, it is passed around the right until it reaches the intended destination.
    - **Star** 
      * Each device is connected directly to a central network switch.
      * Whenever a node sends a message, it is routed to the switch, which then passes the message along to the intended recipient.
      * Most widely used network topology today.
      * Range of applications includes small networks in the home to very large networks in major corporations.
    - **Tree** 
      * Each device is connected to a central node, either directly or through one or more other devices.
      * Central node is connected to two or more subordinate nodes that in turn are connected to other subordinate nodes, and so forth, forming a treelike structure.
      * Also known as a hierarchical network
    - **Mesh**
      * Newest type of topology and does not use a specific physical layout.
      * Requires that each node have more than one connection to the other nodes. The resulting pattern forms the appearance of a mesh.
      * If a path between two nodes is somehow disrupted, data can be automatically rerouted.
      * Wireless technologies are frequently used to build mesh networks.
  + **Strategies** - Every network has a strategy, or way of coordinating the sharing of information and resources. Two of the most common network strategies are client/server and peer-to-peer.
    - **Client/server network** - use central computers to coordinate and supply services to other nodes on the network. The server provides access to resources such as Web pages, databases, application software, and hardware
      * Strategy is based on specialization. Server nodes coordinate and supply specialized services, and client nodes request the services.
      * Commonly used server operating systems are Windows Server, Mac OS X Server, Linux, and Solaris.
      * Client/server networks are widely used on the Internet.
      * Advantage of the client/server network strategy include:
        + Ability to handle very large networks efficiently.
        + Availability of powerful network management software to monitor and control network activities.
      * Disadvantage of the client/server network strategy include:
        + Cost of installation and maintenance
    - **Peer-to-peer (P2P) network** - nodes have equal authority and can act as both clients and servers. Many current popular game, movie, and music sharing services use this network strategy.
      * Advantage of P2P:
        + Easy and inexpensive (often free) to set up and use.
      * Disadvantage of P2P:
        + Lack of security controls or other common management functions.