**Module 7**

**Network fundamentals**

**Advance Question**

**1.Explain Network Topologies Ans. Network topologies refer to the physical or logical layout of interconnected devices in a computer network, defining how they communicate and share information.**

**2.Explain TCP/IP Networking Model Ans. The TCP/IP model is a standard protocol suite that governs communication between devices on a network, comprising Application, Transport, Internet, and Link layers.**

**3.Explain LAN and WAN Network Ans. A local area network (LAN) is a collection of devices connected together in one physical location, such as a building, office, or home. A Wide Area network (WAN) is a network that provides services to a very large geographic area.**

**4.Explain Operation of Switch Ans. A switch operates by efficiently forwarding data frames between devices within a local network based on their MAC addresses, enhancing network performance and reducing collisions.**

**5.Describe the purpose and functions of various network devices Ans. 1.Router: Directs data traffic between different networks, ensuring efficient communication. 2.Switch: Connects devices within a local network, forwarding data only to the intended recipient. 3.Firewall: Monitors and controls incoming/outgoing network traffic to enhance security. 4.Hub: Basic networking device that broadcasts data to all connected devices in a network. 5.Modem: Converts digital data from a computer into signals for transmission over communication lines. 6.Access Point: Enables wireless devices to connect to a wired network. 7.Bridge: Connects and filters traffic between different network segments. 8.Gateway: Translates data between different communication protocols or network architectures. 9.Repeater: Extends the range of a network by amplifying and retransmitting signals. 10.Load Balancer: Distributes network traffic across multiple servers to optimize resource utilization.**

**6. Make list of the appropriate media, cables, ports, and connectors to connect switches to other Ans. Media: Ethernet cables .Cat5e, Cat6, Cat6a, or Cat7. Fiber optic cables .single-mode or multi-mode.**

**Cables: Straight-through Ethernet cables for connecting switches to end devices (e.g., computers, printers). Crossover Ethernet cables for directly connecting switches to switches without an intermediary device.**

**Ports: Ethernet ports on the switches (commonly RJ45 ports for copper connections). Fiber optic ports (LC, SC, ST, etc.) for connecting switches over long distances using fiber optic cables.**

**Connectors: RJ45 connectors for Ethernet cables. Fiber optic connectors (e.g., LC, SC, ST) for fiber optic cables. SFP (Small Form-factor Pluggable) or GBIC (Gigabit Interface Converter) modules for modular switch ports, especially for fiber optic connections.**

**7.Define Network devices and hosts Ans. Network Devices: Hardware or software components facilitating communication within a network, such as routers, switches, and firewalls.**

**Hosts: Devices connected to a network, identified by unique IP addresses, capable of sending and receiving data, including computers, servers, and printers.**

**8.What are Ethernet Standard (802.3) and Frame Formats? Ans. Ethernet Standard (802.3): A set of protocols and standards defining the physical and data link layers for wired Ethernet networks, specifying aspects like frame format and media access control.**

**Frame Formats: Ethernet frame formats define the structure of data packets, including fields like destination and source addresses, type/length, payload, and checksum, ensuring standardized communication in Ethernet networks.**

**Intermediate Question**

**1.Comparison between UTP, MM and SM Ethernet Cabling Ans. UTP (Unshielded Twisted Pair): Commonly used for short to medium-distance networking. Affordable and easy to install. Susceptible to electromagnetic interference. Typically used in Ethernet networks, such as Cat5e, Cat6, or Cat6a cables.**

**MM (Multimode) Fiber: Suitable for short to moderate distances. Uses multiple light paths (modes) simultaneously. Higher data transmission rates over shorter distances.**

**SM (Single Mode) Fiber: Designed for longer distances and high bandwidth. Uses a single light path (mode). Lower signal attenuation, suitable for long-haul and high-speed applications.**

**2.Make Cross cable Ans. done**

**3.Make Straight-Through Cable Ans. done**

**4. Differentiate between LAN/WAN operation and features Ans. LAN (Local Area Network): Operation: Covers a limited geographical area like a building or campus. Features: Typically high data transfer rates, low latency, and can be privately owned.**

**WAN (Wide Area Network): Operation: Spans over large geographical distances, possibly across cities or countries. Features: Lower data transfer rates compared to LANs, higher latency, and often utilizes public or leased telecommunication lines.**

**5.Explain ARP, ICMP and Domain name Ans. ARP (Address Resolution Protocol): Resolves IP addresses to MAC addresses within a local network. ICMP (Internet Control Message Protocol): Provides messaging and error reporting functions, including ping requests and replies. Domain Name: A human-readable name that maps to an IP address, facilitating easier website access on the internet.**

**6.Describe the components required for network and Internet communications**

**Ans. Hardware Devices: Such as routers, switches, modems, and cables, facilitate physical and data link connections within networks.**

**Protocols: Standards like TCP/IP define rules for data packaging, addressing, and transmission between devices and across the Internet.**

**Software Applications: Programs like web browsers and email clients utilize protocols to send and receive data over networks and the Internet.**

**7. Explain Encapsulation and DE capsulation in OSI Reference model Ans. In the OSI Reference Model: Encapsulation: As data moves down the layers, each OSI layer adds its own header or footer (protocol information) to the data. DE capsulation: When data is received, each OSI layer strips off its respective header or footer to process and forward the data to the next layer.**

**8.Explain network segmentation and basic traffic management concepts Ans. Network Segmentation: Dividing a network into smaller subnetworks to improve performance, security, and manageability. Bandwidth Management: Prioritizing and allocating network resources to optimize traffic flow and prevent congestion. Quality of Service (QoS): Mechanisms that ensure specific levels of performance for various types of network traffic based on priorities.**

**9.What is flow control and acknowledgment? Ans. Flow Control: Mechanism to regulate the data transmission rate between sender and receiver to prevent overwhelming the receiver. Acknowledgment: Signal sent by the receiver back to the sender to confirm successful receipt of data packets or segments.**

**Advance question**

**1.Use the OSI and TCP/IP models and their associated protocols to explain how data Flows in a network Ans. Data flows through a network by encapsulating and de-encapsulating information as it traverses layers: OSI model, data moves from the Application (Layer 7) down to the Physical Layer (Layer 1), with each layer adding or removing its respective headers or trailers.**

**TCP/IP model is more streamlined, where data similarly flows from the Application to the Network Access layer, with protocols like HTTP (at Layer 7) being mapped to its TCP/IP counterpart, like HTTP over TCP for web traffic.**

**2. Identify and explain at layers 1, 2, 3, and 7 using a layered model approach Ans. Layer 1 - Physical Layer: Function: Concerned with the physical connection between devices and the transmission and reception of raw data bits over a physical medium. Explanation: At this layer, data is converted into signals for transmission over the network medium, whether it's copper cables, fiber optics, or wireless.**

**Layer 2 - Data Link Layer. Function: Responsible for node-to-node communication and provides a reliable link between devices on the same local network (LAN). Explanation: Data frames are addressed and packaged here, and MAC addresses are used to uniquely identify devices in a local network. Switches operate primarily at this layer,**

**Layer 3 - Network Layer: Function: Determines how data is routed from one network to another, including addressing, packet forwarding, and logical addressing (like IP addresses). Explanation: Routers operate at this layer, making decisions based on IP addresses to determine the best path for data to travel from the source to the destination across interconnected networks.**

**Layer 7 - Application Layer: Function: Interacts directly with end-user applications. This is where applications access network services and where application layer protocols such as HTTP, FTP, and SMTP operate. Explanation: This is the layer closest to the end-user and provides services like file transfer, email services, web browsing, and more. It ensures that data is formatted and presented correctly for user-level applications.**

**3. Explain CSMA/CD and CSMA/CA Ans. CSMA/CD: A protocol used in Ethernet networks to manage collisions by detecting them and subsequently initiating a random BACKOFF.**

**CSMA/CA: A protocol used in wireless networks to manage access by sensing the medium before transmission and employing a contention mechanism to avoid collisions.**

**4. Explain this frame and find layer Ans. If you're referring to a specific software framework, system architecture, or another technical concept, please provide more context or specify what you're looking for so I can help you effectively**

**5. Draw and explain Cisco hierarchical model Ans. The Cisco hierarchical model consists of three layers: core, distribution, and access. Core handles backbone connections, distribution connects core to access, and access connects end devices. It improves scalability, performance, and manageability of networks.**

**6. Drawing of a typical wired and wireless enterprise LAN Ans. wired enterprise LAN, imagine: Multiple desktop computers connected to Ethernet switches. Those interconnected, possibly using higher-speed links. central core switch or router providing connectivity to the wider network or internet.**

**wireless enterprise LAN, imagine: Access Points (APs) spread throughout the building. Devices like laptops, , and tablets connecting wirelessly to these APs. APs connected to switches for backhaul connectivity to the main network.**

**7. Describe the uses of straight-through and crossover Ethernet cables Ans. Straight-through Ethernet cables connect devices of different types like a computer to a switch, while crossover cables connect similar devices for direct communication.**

**8.Explain Layer 2 and Layer 3 Switch Ans. Layer 2 Switch operates at the Data Link layer, using MAC addresses for forwarding frames within a local network, while Layer 3 Switch operates at the Network layer, making routing decisions based on IP addresses to forward packets between different networks.**

**9.Identifying Collision and Broadcast Domains Ans. A collision domain is a network segment where packet collisions can occur, while. a broadcast domain is a network area where broadcast packets are forwarded.**

**10.Explain Spanning Tree Protocol Ans. spanning tree protocol is a network protocol that prevents loops in Ethernet networks. STP identifies and blocks redundant paths in a network topology, ensuring a loop-free path for data transmission.**

**11.Explain uncast Multicast and Broadcast Ans. 1.Unicast: One-to-one communication where data is sent from a single sender to a specific receiver.**

**2. Multicast: One-to-many communication where data is sent from one sender to multiple specific receivers who have expressed interest in receiving the data.**

**3.Broadcast: One-to-all communication where data is sent from a single sender to all devices within a network segment or domain without specifying individual recipients.**

**12.Explain CAM (Content Addressable Memory) Ans. CAM (Content Addressable Memory) is a type of memory that allows for quick searches and comparisons by simultaneously comparing data in parallel rather than sequentially.**

**13.Explain CAM (Ternary Content Addressable Memory) Ans. Ternary Content Addressable Memory (TCAM) is a specialized type of memory that allows for fast table lookups using wildcard matching for more flexible and efficient search operations.**

**14.Which command use of Show MAC TABLE? Ans. The "show MAC address-table" command on a network switch displays the MAC address entries mapped to specific switch ports. This helps in understanding the MAC addresses learned by the switch and their associated port locations.**