**TERM-2 CCNA Assignment**

**// LOKESH PANCHAL // 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.