Computer Network Assignment

1. Roles/Functions of Each Layer in the OSI Network Model

- Physical Layer:

Transmits raw bitstreams over a physical medium. Involves hardware like cables, switches, and network interface cards. Defines electrical, mechanical, and procedural aspects.

- Data Link Layer:

Ensures reliable data transfer between two nodes. Performs error detection/correction and flow control. Examples: Ethernet, PPP.

- Network Layer:

Manages routing and forwarding of packets. Assigns IP addresses and handles logical addressing. Protocols: IP, ICMP, OSPF.

- Transport Layer:

Ensures reliable transmission of data between host systems. Provides error recovery, flow control, and segmentation. Protocols: TCP, UDP.

- Session Layer:

Manages sessions or connections between applications. Controls dialog and synchronization.

- Presentation Layer:

Translates data between application and network format. Handles data encryption, compression, and encoding.

- Application Layer:

Closest to the user. Provides network services like email, file transfer, and web browsing. Protocols: HTTP, FTP, DNS.

2. OSPF Routing Protocol

1. (a) How it formulates the routing table:

OSPF routers exchange Link-State Advertisements (LSAs). Builds a Link-State Database (LSDB) with full network topology. Uses Dijkstra's algorithm to calculate the shortest path tree. The routing table is derived from this tree.

2. (b) The timers it uses:

- Hello Timer – Time between Hello packets (default 10s on broadcast).

- Dead Timer – Time to wait before declaring neighbor down (default 40s).

- Wait Timer – Time to wait during DR/BDR election.

- Retransmit Timer – Time to wait before retransmitting LSAs.

3. (c) Factors for choosing best route:

- Cost (metric) – Based on bandwidth; lower cost preferred.

- Link State – Real-time topology data ensures optimal path.

- Administrative configuration – Can prefer certain routes manually.

4. (d) Administrative Distance:

110 – OSPF has an administrative distance of 110, indicating its trust level compared to other protocols (e.g., RIP – 120, EIGRP – 90).

5. (e) Configuration commands (Cisco IOS example):

Router(config)# router ospf 1

3. Transmission Media in Networks

6. (a) Media Diagram:

Include a diagram showing Twisted Pair, Coaxial, Fiber Optic, and Wireless media.

7. (b) Type of signal used:

- Twisted Pair – Electrical signals

- Coaxial Cable – Electrical signals

- Fiber Optic – Light signals

- Wireless – Electromagnetic/radio waves

8. (c) Use of each media:

- Twisted Pair: LAN cabling (Ethernet)

- Coaxial: Cable TV and older LANs

- Fiber Optic: High-speed, long-distance communication

- Wireless: Wi-Fi, mobile networks, satellite

9. (d) Advantages & Disadvantages:

Media Type	Advantages	Disadvantages
Twisted Pair	Cheap, easy to install	Limited bandwidth, susceptible to EMI
Coaxial Cable	Better shielding, moderate cost	Bulky, less flexible
Fiber Optic	High speed, immune to interference	Expensive, fragile
Wireless	Flexible, mobile access	Interference, security concerns