Networking Fundamentals (CO3, CO4, CO5)

Q1. **Define ARP and its primary purpose** ARP (Address Resolution Protocol) maps an IP address to a MAC address in a local network. It enables devices to locate each other on the same LAN. ARP requests are broadcast, while replies are unicast. It is essential for IP-based communication over Ethernet.

Q2. **Two advantages of IPv6 over IPv4**

- Larger address space (128-bit vs 32-bit)
- Built-in support for security via IPsec IPv6 eliminates the need for NAT due to abundant addresses. It supports auto-configuration and improved routing efficiency.

Q3. **Define Unicast Routing and give an example** Unicast routing sends data from one source to one specific destination. Example: Sending an email from one user to another. It uses destination IP to forward packets. Protocols like OSPF and RIP support unicast routing.

Q4. **Main difference between Distance Vector and Link State routing** Distance Vector shares entire routing tables periodically. Link State shares only link status and builds a complete network map. Distance Vector uses Bellman-Ford; Link State uses Dijkstra's algorithm. Link State is faster and more scalable in large networks.

Q5. **Define OSPF and its primary purpose** OSPF (Open Shortest Path First) is a link-state routing protocol. It finds the shortest path in an IP network using Dijkstra's algorithm. OSPF supports hierarchical routing with areas. It converges quickly and avoids routing loops.