What is a subnet?

- Answer: A network in which IP addresses have a common prefix.

What does CIDR stand for?

- Answer: Classless Interdomain Routing.

Define throughput.

- Answer: The rate at which data is successfully transmitted over a network.

What does IP stand for in networking?

- Answer: Internet Protocol.

What is the default subnet mask for a Class A IP address?

- Answer: 255.0.0.0.

In TCP, what is the use of a congestion window?

- Answer: It controls the amount of data the sender can transmit without receiving an ACK.

What protocol offers reliable data transfer?

- Answer: TCP.

State True or False: UDP provides error detection and recovery.

- Answer: False.

What does TTL stand for?

- Answer: Time to Live.

In IP addressing, what is the maximum size of the payload in bytes?

- Answer: 65,535 bytes.

What is a router's function at Layer 3?

- Answer: Forwarding datagrams.

State True or False: TCP segments are divided into IP datagrams.

- Answer: True.

What does a subnet mask of /24 mean?

- Answer: It means the first 24 bits are fixed in an IP address.

Define pipelining in data transfer protocols.

- Answer: Sending multiple packets before waiting for acknowledgments.

What is the Go-Back-N protocol?

- Answer: A pipelining protocol where the sender sends multiple packets but must retransmit all packets after a packet loss.

State True or False: UDP provides guaranteed delivery of data.

- Answer: False.

What is the purpose of flow control in TCP?

- Answer: To prevent the receiver's buffer from overflowing.

Which IP version uses a 32-bit address space?

- Answer: IPv4.

What is a TCP sequence number?

- Answer: It tracks the order of bytes sent over a TCP connection.

What does RDT stand for in network communication?

- Answer: Reliable Data Transfer.

State True or False: A router only operates up to the transport layer.

- Answer: False (it operates up to Layer 3).

What is the role of an acknowledgment (ACK) in TCP?

- Answer: To confirm the successful receipt of data.

What does ARP stand for?

- Answer: Address Resolution Protocol.

State True or False: A switch operates at Layer 2 of the OSI model.

- Answer: True.

What is a maximum segment size (MSS)?

- Answer: The largest chunk of data that a TCP segment can carry.

What is the main difference between TCP and UDP?

- Answer: TCP provides reliable data transfer; UDP does not.

What does the SYN flag in TCP signify?

- Answer: It indicates the start of a TCP connection.

What is the size of the IPv4 header?

- Answer: Typically 20 bytes (without options).

State True or False: TCP supports full-duplex communication.

- Answer: True.

What is the Go-Back-N ARQ used for?

- Answer: Error correction by retransmitting a batch of packets after detecting a packet loss.

State True or False: In TCP, data is sent in packets called segments.

- Answer: True.

What is the purpose of a checksum in IP headers?

- Answer: To detect errors in transmitted packets.

What is the difference between a port number and an IP address?

- Answer: An IP address identifies a device, while a port number identifies a specific application/service.

What is the purpose of the window size field in TCP?

- Answer: It specifies the size of the sender's transmission window.

In networking, what does NAT stand for?

- Answer: Network Address Translation.

State True or False: TCP uses cumulative acknowledgments.

- Answer: True.

What does the PSH flag in a TCP segment indicate?

- Answer: Immediate delivery of the data to the application.

Define round-trip time (RTT) in TCP.

- Answer: The time it takes for a signal to go from sender to receiver and back.

What is the role of a TCP timer?

- Answer: To determine when a retransmission is needed after a timeout.

What protocol does TCP use for congestion control?

- Answer: AIMD (Additive Increase Multiplicative Decrease).

What is the role of DHCP in networking?

- Answer: Assigning IP addresses dynamically.

State True or False: TCP guarantees in-order delivery of packets.

- Answer: True.

What is packet loss?

- Answer: The failure of one or more packets to reach their destination.

What does the UDP header contain?

- Answer: Source port, destination port, length, and checksum.

What does a firewall do?

- Answer: It monitors and controls incoming and outgoing network traffic.

What is a DNS server responsible for?

- Answer: Resolving domain names to IP addresses.

State True or False: TCP is connection-oriented.

- Answer: True.

What is a selective repeat ARQ?

- Answer: A protocol where only the corrupted packets are retransmitted.

What is the range of sequence numbers used in Go-Back-N ARQ protocol?

- Answer: [0, 2^k - 1], where k is the number of bits in the sequence number.

What does RDT stand for in networking?

- Answer: Reliable Data Transfer.

Explain the Stop-and-Wait protocol.

- Answer: A protocol where the sender sends one packet and waits for an acknowledgment before sending the next one.

What is the purpose of an acknowledgment (ACK) packet?

- Answer: It informs the sender that a packet was received successfully.

What does ARQ stand for?

- Answer: Automatic Repeat Request.

In Selective Repeat ARQ, how are errors handled?

- Answer: Only the erroneous packets are retransmitted.

What is TCP?

- Answer: Transmission Control Protocol.

True or False: TCP guarantees reliable data transfer.

- Answer: True.

What is the size of the TCP sequence number field?

- Answer: 32 bits.

What is the function of the sliding window protocol in TCP?

- Answer: It controls the flow of data and ensures efficient use of network bandwidth.

What is RTT in networking?

- Answer: Round Trip Time, the time taken for a signal to go to the receiver and back.

What is the purpose of the checksum field in the IP header?

- Answer: To detect errors in the IP header.

What is fragmentation in IP networking?

- Answer: Breaking down a large packet into smaller packets to accommodate the MTU of a network.

What does TTL stand for?

- Answer: Time to Live.

What does the TCP three-way handshake involve?

- Answer: SYN, SYN-ACK, ACK.

Explain the slow start phase in TCP.

- Answer: TCP starts with a small congestion window and increases it exponentially until packet loss occurs.

What happens when TCP detects packet loss through a timeout?

- Answer: It reduces the congestion window and retransmits the lost packet.

Define pipelining in the context of reliable data transfer.

- Answer: Sending multiple packets before waiting for acknowledgments to improve throughput.

What is the purpose of the selective acknowledgment (SACK) option in TCP?

- Answer: It allows the receiver to acknowledge out-of-order packets, improving efficiency.

What is the function of the transport layer in the OSI model?

- Answer: It provides reliable data transfer, flow control, and error correction.

Explain the difference between UDP and TCP.

- Answer: TCP is connection-oriented and reliable, while UDP is connectionless and does not guarantee delivery.

What is the maximum length of a UDP datagram?

- Answer: 65,535 bytes.

What does the ICMP protocol do?

- Answer: It handles error reporting and network diagnostics (e.g., ping).

In the OSI model, which layer is responsible for routing packets?

- Answer: The Network Layer.

What is NAT in networking?

- Answer: Network Address Translation, which maps private IP addresses to a public IP address.

What is the main difference between IPv4 and IPv6?

- Answer: IPv4 uses 32-bit addresses, while IPv6 uses 128-bit addresses.

True or False: IPv6 eliminates the need for NAT.

- Answer: True.

What is meant by port forwarding?

- Answer: Redirecting communication requests from one address and port number to another.

Explain the concept of flow control in TCP.

- Answer: It ensures that the sender does not overwhelm the receiver with too much data at once.

What is a SYN flood attack?

- Answer: A type of denial-of-service attack where the attacker sends many SYN requests to overwhelm a server.

True or False: In the OSI model, the application layer provides end-to-end communication.

- Answer: False, the Transport Layer provides end-to-end communication.

What is the function of the DNS protocol?

- Answer: It resolves domain names into IP addresses.

What is a DHCP server responsible for?

- Answer: Assigning dynamic IP addresses to devices on a network.

What is the role of an access point in a wireless network?

- Answer: It allows wireless devices to connect to a wired network.

Which protocol is used for securely transferring files over the internet?

- Answer: SFTP (Secure File Transfer Protocol).

What does HTTP stand for?

- Answer: Hypertext Transfer Protocol.

What is the primary function of a firewall?

- Answer: To protect a network by filtering incoming and outgoing traffic based on security rules.

What does SSL stand for?

- Answer: Secure Sockets Layer.

What layer does the Ethernet protocol operate at in the OSI model?

- Answer: The Data Link Layer.

True or False: MPLS is a routing technique used in IP networks.

- Answer: True.

What is the purpose of VLANs in a network?

- Answer: To create separate broadcast domains in a single physical network.

What does QoS stand for?

- Answer: Quality of Service.

What is BGP and why is it important?

- Answer: Border Gateway Protocol, it is the protocol used to exchange routing information between autonomous systems on the internet.

True or False: Routers operate at the Data Link Layer of the OSI model.

- Answer: False, they operate at the Network Layer.

What is a MAC address?

- Answer: A unique identifier assigned to network interfaces for communication at the Data Link Layer.

Define packet switching.

- Answer: A method of transferring data by breaking it into packets and sending them independently over a network.

What is latency in networking?

- Answer: The delay between a sender sending a message and the receiver receiving it.

What is the role of an ISP?

- Answer: Internet Service Provider, a company that provides access to the internet.

What is the function of the ARP protocol?

- Answer: Address Resolution Protocol, it maps an IP address to a MAC address.

What is a proxy server used for?

- Answer: To act as an intermediary between a client and a server, often used for anonymity or filtering traffic.

What is jitter in networking?

- Answer: The variation in time delay of packet delivery.

What is a default gateway? - Answer: The device that routes traffic from a local network to external networks (usually a router).

Subjective Questions

1. Explain the working of the Go-Back-N ARQ protocol with a diagram.
2. Compare and contrast TCP and UDP in terms of reliability and use cases.
3. Describe the process of TCP's three-way handshake for establishing a connection.
4. Discuss the significance of the congestion window in TCP and how it adjusts based on network conditions.
5. Explain the concept of network address translation (NAT) and its types.
6. What is DNS and how does it resolve a domain name to an IP address?
7. Describe the steps involved in DHCP address allocation and renewal.
8. Explain the difference between connection-oriented and connectionless services in networking.
9. Describe the sliding window protocol and its role in flow control and error detection.
10. Explain how packet switching works in a network and its advantages over circuit switching.
11. Discuss the principle of flow control in TCP and how it prevents buffer overflow at the receiver's end.
12. Explain the structure of an IPv4 datagram and its key fields.
13. What is ARP? Explain how it works to resolve IP addresses to MAC addresses in a local network.
14. Compare Selective Repeat and Go-Back-N ARQ protocols in terms of efficiency and retransmission.
15. Explain the steps in the TCP timeout and retransmission mechanism, and how it ensures reliable delivery.
16. Describe how CIDR (Classless Interdomain Routing) works and its advantages over classful IP addressing.
17. Discuss the working of the OSI model and the functions of its seven layers.
18. How does BGP work to exchange routing information between different autonomous systems?
19. What is the purpose of error detection and correction mechanisms in networking, and how do they work?
20. Explain the role of ICMP in network communication and give examples of how it is used for diagnostics.