Basic Networking Concepts

1. **What are 10Base2, 10Base5, and 10BaseT Ethernet LANs?**
    - **10Base2**: Thin coaxial cable (maximum 185m).
    - **10Base5**: Thick coaxial cable (maximum 500m).
    - **10BaseT**: Twisted pair cables (maximum 100m).
2. **What is the difference between an unspecified passive open and a fully specified passive open?**
    - **Unspecified Passive Open**: Listens on all interfaces for any incoming connections.
    - **Fully Specified Passive Open**: Listens only for a specific connection on a defined IP and port.
3. **Explain the function of Transmission Control Block (TCB).**
    - **TCB** stores state information for each TCP connection (e.g., source/destination port, sequence numbers).
4. **What is a Management Information Base (MIB)?**
    - **MIB** is a database used for managing network devices in SNMP (Simple Network Management Protocol).
5. **What is anonymous FTP and why would you use it?**
    - Allows users to access files on an FTP server without authentication. Useful for public file sharing.

NS2 and Simulation-Specific

6. **What are the front-end and back-end languages used in NS2?**
    - **Front-end**: OTcl (for configuration).
    - **Back-end**: C++ (for core simulation).
7. **Which layer of the 7-layer model provides services to the Application layer over the Session layer connection?**
    - **Presentation Layer.**
8. **What is the full form of OTcl?**
    - **Object-oriented Tool Command Language.**
9. **What is Point-to-Point Communication?**
    - A direct connection between two nodes for data exchange.
10. **Which OSI layer controls application-to-application communication?**
    - **Transport Layer.**

11. **What is a DNS resource record?**
    - A DNS entry that stores information (e.g., IP address for a domain).
12. **What is the meaning of NAM?**
    - **Network Animator.**
13. **What protocol is used by DNS name servers?**
    - **UDP (port 53)** for queries; **TCP** for zone transfers.

Routing and Protocols

14. **What is the difference between interior and exterior neighbor gateways?**
    - **Interior**: Operate within the same autonomous system (e.g., OSPF, RIP).
    - **Exterior**: Operate between different autonomous systems (e.g., BGP).
15. **What is the HELLO protocol used for?**
    - Used by routing protocols (e.g., OSPF) to discover and maintain neighbor relationships.
16. **What are the advantages and disadvantages of routing tables?**
    - **Advantages**: Efficient routing, faster packet forwarding.
    - **Disadvantages**: Requires maintenance, can become large in dynamic networks.
17. **What is source routing?**
    - A routing method where the sender specifies the entire path the packet should take.
18. **What is RIP (Routing Information Protocol)?**
    - A distance-vector routing protocol using hop count as the metric.
19. **What is SLIP (Serial Line Interface Protocol)?**
    - An older protocol for encapsulating IP packets over serial links.
20. **What is Proxy ARP?**
    - A technique where one device answers ARP requests on behalf of another.
21. **What is OSPF?**
    - **Open Shortest Path First**, a link-state routing protocol for interior gateway routing.
22. **What is Kerberos?**
    - A network authentication protocol using tickets to provide secure communication.
23. **What is a Multi-homed Host?**
    - A host connected to multiple networks.

24. **What is NVT (Network Virtual Terminal)?**
    - A conceptual interface for Telnet communication.
25. **What is BGP (Border Gateway Protocol)?**
    - A protocol for routing between autonomous systems on the internet.
26. **What is autonomous system?**
    - A collection of IP networks managed by a single entity, using a common routing policy.
27. **What is EGP (Exterior Gateway Protocol)?**
    - An older protocol for routing between autonomous systems (replaced by BGP).
28. **What is IGP (Interior Gateway Protocol)?**
    - Routing protocols within an autonomous system (e.g., OSPF, RIP).
29. **What is a Mail Gateway?**
    - A server that transfers emails between different email systems.
30. **What is the Wide-Mouth Frog protocol?**
    - A key exchange protocol for secure communication.
31. **What is Silly Window Syndrome?**
    - A TCP issue caused by inefficient data transfer due to small window sizes.

Networking Devices and Functions

32. **What is multicast routing?**
    - Routing where data is delivered to multiple destinations simultaneously.
33. **What is traffic shaping?**
    - Managing network traffic to ensure predictable performance.
34. **What is a packet filter?**
    - A device or program that inspects and filters packets based on specific criteria.
35. **What is a virtual path?**
    - A logical connection between two endpoints in ATM networks.
36. **What is a virtual channel?**
    - A sub-path within a virtual path in ATM networks.
37. **What is a logical link control (LLC)?**
    - A sublayer of the Data Link Layer that handles flow and error control.

38. **What is the difference between routable and non-routable protocols?**
    - **Routable**: Can pass through routers (e.g., IP).
    - **Non-routable**: Cannot pass through routers (e.g., NetBEUI).

OSI Model and Protocol Suite

39. **What is the minimum and maximum length of the header in the TCP segment and IP datagram?**
    - **TCP header**: 20 to 60 bytes.
    - **IP header**: 20 to 60 bytes.
40. **What is the difference between ARP and RARP?**
    - **ARP**: Resolves IP to MAC.
    - **RARP**: Resolves MAC to IP.
41. **What is ICMP?**
    - Internet Control Message Protocol, used for error reporting and diagnostics.
42. **What are the data units at different layers of the TCP/IP protocol suite?**
    - Application: **Message**
    - Transport: **Segment**
    - Network: **Packet**
    - Data Link: **Frame**
    - Physical: **Bits**

Additional Protocols and Networking Concepts

43. **What is DHCP?**
    - **Dynamic Host Configuration Protocol**, assigns IP addresses automatically.
44. **What is a subnet?**
    - A smaller network segment within a larger network.
45. **What is the 5-4-3 rule?**
    - In Ethernet networks, between two nodes, there can be a maximum of:
        - 5 segments
        - 4 repeaters
        - 3 populated segments.

46. **What is attenuation?**
    - Loss of signal strength over distance.
47. **What is a mesh network?**
    - A network where every device connects to every other device.
48. **What is the essence of RSVP (Resource Reservation Protocol)?**
    - Reserves resources across a network for data flows.
49. **What is the protocol number for TCP and UDP?**
    - **TCP**: 6, **UDP**: 17.

Networking Architectures, Components, and Processes

50. **What is the Internet Control Message Protocol (ICMP)?**

- ICMP is a network layer protocol used for sending error messages and operational information, e.g., ping uses ICMP to check connectivity.

51. **What is Project 802?**

- A project by IEEE to define standards for LANs and MANs. It includes Ethernet (802.3), Wireless LAN (802.11), etc.

52. **What is Bandwidth?**

- The maximum data transfer rate of a network or link, measured in bits per second (bps).

53. **Difference between bit rate and baud rate?**

- **Bit rate**: Number of bits transmitted per second.
- **Baud rate**: Number of signal units transmitted per second.

54. **What is a MAC address?**

- A unique identifier assigned to a network interface card (NIC) for communication at the data link layer.

55. **What is attenuation?**

- A reduction in signal strength as it travels through a medium.

56. **What is cladding?**

- The outer optical material surrounding the core of a fiber optic cable, used to reflect light back into the core.

NS2-Specific Concepts

57. **Explain the five components of NS2.**

- **Event Scheduler**: Schedules simulation events.
- **Network Components**: Contains C++ modules for nodes, agents, links.
- **OTcl Library**: Configures the simulation via scripts.
- **Tclcl**: Links OTcl scripts to C++ objects.
- **Trace Files**: Logs data for simulation analysis.

58. **What is post-processing in NS2?**

- Analyzing trace file data using tools like awk or xgraph to evaluate performance metrics.

59. **What is the command used to filter in a trace file?**

- Example: grep "^r" file.tr to filter received packets.

Layer-Specific Details and Protocols

60. **What is Beaconing?**

- A process where devices periodically send signals to announce their presence on a network, common in wireless LANs.

61. **What is terminal emulation, and in which layer does it occur?**

- Terminal emulation allows a system to act as another terminal. It occurs at the **Application Layer**.

62. **What is frame relay, and in which layer does it occur?**

- Frame Relay is a WAN protocol for transferring data over a virtual circuit. It operates at the **Data Link Layer**.

63. **What do you mean by “triple X” in Networks?**

- Refers to the **X.25** protocol suite used in packet-switched networks.

64. **What is SAP?**

- **Service Access Point** is a reference point for accessing network services at the OSI model layers.

65. **What is a subnet?**

- A smaller network within a larger IP network, defined by subnet masks.

66. **What is a Brouter?**

- A hybrid device that acts as both a bridge and a router.

67. **How is a gateway different from a router?**

- A **router** connects networks with the same protocol, while a **gateway** connects networks using different protocols.

68. **What are the different types of networking/internetworking devices?**

- **Hub**, **Switch**, **Router**, **Gateway**, **Modem**, **Bridge**, **Repeater**.

69. **What is a mesh network?**

- A network topology where each node connects to multiple other nodes, ensuring high redundancy.

70. **What is passive topology?**

- A topology where nodes do not actively participate in data transmission (e.g., a bus topology).

Network Architectures and Protocols

71. **What are the important topologies for networks?**

- **Bus**, **Star**, **Ring**, **Mesh**, and **Hybrid**.

72. **What are the major types of networks?**

- **LAN**: Local Area Network.
- **WAN**: Wide Area Network.
- **MAN**: Metropolitan Area Network.
- **PAN**: Personal Area Network.

73. **What is a Protocol Data Unit (PDU)?**

- The data format exchanged at a given layer of the OSI model (e.g., frames, packets, segments).

74. **What is the difference between baseband and broadband transmission?**

- **Baseband**: Single signal over the medium.
- **Broadband**: Multiple signals over the medium.

75. **What are the possible ways of data exchange?**

- **Simplex**: One-way communication.
- **Half-Duplex**: Two-way communication, one direction at a time.
- **Full-Duplex**: Two-way communication simultaneously.

76. **What are the types of transmission media?**

- **Wired**: Twisted pair, coaxial cable, fiber optics.
- **Wireless**: Radio waves, microwaves, infrared.

77. **Difference between communication and transmission?**

- **Communication**: Exchange of information.
- **Transmission**: Physical transfer of data.

Protocols, Layer Functions, and Addresses

78. **The Internet Control Message Protocol occurs at what layer of the seven-layer model?**

- **Network Layer.**

79. **Which protocol resolves an IP address to a MAC address?**

- **ARP (Address Resolution Protocol).**

80. **MPEG is an example of what layer of the OSI seven-layer model?**

- **Application Layer.**

81. **What is the protocol number for UDP?**

- **17.**

82. **Which protocol is used for booting diskless workstations?**

- **BOOTP** (Bootstrap Protocol) or **DHCP**.

83. **Which layer is responsible for putting 1s and 0s into a logical group?**

- **Data Link Layer.**

84. **What does 'P' mean when running a trace?**

- Indicates a **packet** in NS2 trace files.

85. **UDP works at which layer of the DOD model?**

- **Transport Layer.**

Encapsulation, Devices, and Addressing

86. **What is the first step in data encapsulation?**

- Adding application layer headers to the data.

87. **What is the default encapsulation of Netware 3.12?**

- **802.3 Raw.**

88. **Ping uses which Internet layer protocol?**

- **ICMP.**

89. **Which switching technology can reduce the size of a broadcast domain?**

- **VLAN (Virtual Local Area Network).**

90. **What is the protocol number for TCP?**

- **6.**

91. **What is the use of Xgraph plotting in NS2?**

- To visualize data from trace files, such as throughput and delay.

92. **Repeaters work at which layer of the OSI model?**

- **Physical Layer.**

93. **WAN stands for?**

- **Wide Area Network.**

94. **LAN stands for?**

- **Local Area Network.**

95. **DHCP stands for?**

- **Dynamic Host Configuration Protocol.**

96. **What does the acronym ARP stand for?**

- **Address Resolution Protocol.**

97. **Which layer is responsible for identifying and establishing the availability of the intended communication partner?**

- **Session Layer.**

98. **Which OSI layer provides mechanical, electrical, and procedural activation for maintaining the physical link?**

- **Physical Layer.**

99. **Define Network?**

- A network is a collection of interconnected devices (computers, servers, etc.) that share resources and data.

100. **What is a Link?**

- A physical or logical connection between two nodes in a network.

101. **What is a Node?**

- Any device (e.g., computer, router, or switch) in a network capable of sending or receiving data.

102. **What is a Gateway or Router?**

- A **gateway** connects networks using different protocols, while a **router** forwards data packets between networks using the same protocol.

103. **What is Point-to-Point Link?**

- A direct communication link between two devices or nodes.

104. **What is Multiple Access?**

- A method where multiple devices share the same communication medium.

Multimedia Networking and QoS

105. **What is the essence of RSVP? Explain a suitable example.**

- **Resource Reservation Protocol (RSVP)** reserves network resources for specific data flows to ensure Quality of Service (QoS).
- Example: Reserving bandwidth for a video conferencing application.

106. **What is the need for scheduling and policing techniques in multimedia networking?**

- These techniques prioritize time-sensitive traffic (e.g., video) and control bandwidth usage to maintain QoS.

107. **What is the need for RTCP protocol along with RTP protocol in multimedia communication?**

- **RTP (Real-Time Transport Protocol)** handles data delivery, while **RTCP (Real-Time Transport Control Protocol)** monitors and provides feedback on the quality of the data transmission.

Architectures and Protocol Layers

108. **Explain WAN architecture in detail.**

- **WAN (Wide Area Network)** spans large geographic areas and connects multiple LANs using technologies like leased lines, MPLS, or satellite links. Key components:
    - **Core Routers**: Manage backbone connections.
    - **Access Points**: Connect devices to the WAN.
    - **Protocols**: MPLS, ATM, Frame Relay.

109. **Explain email architecture and its services.**

- Email architecture includes:
    - **User Agents (UA)**: Applications like Gmail or Outlook.
    - **Mail Transfer Agents (MTA)**: Protocols like SMTP to send emails.
    - **Mail Access Agents (MAA)**: Protocols like IMAP/POP to retrieve emails.

110. **Explain Bluetooth architecture with a diagram.**

- **Bluetooth Architecture** consists of:

- **Piconet**: A small network of up to 8 devices (1 master and up to 7 slaves).
- **Scatternet**: Multiple interconnected piconets.
- **Protocol Stack**:
  - **Baseband**: Handles physical transmission.
  - **L2CAP**: Provides multiplexing and segmentation/reassembly.
  - **HCI**: Interface between hardware and software.

ATM and Networking Layers

111. **Discuss various layers used in ATM architecture.**

- **ATM (Asynchronous Transfer Mode)** has three layers:
  1. **Physical Layer**: Defines transmission over physical media.
  2. **ATM Layer**: Handles cell switching and addressing.
  3. **Adaptation Layer (AAL)**: Supports higher-layer protocols like IP.