1. A router examines header fields in all IP datagrams passing through it.
   1. True
   2. False
2. First generation routers used \_\_\_\_\_\_\_\_\_\_\_ .
   1. packet copying directly from NIC to system memory, back to NIC
   2. direct switching under direct control of CPU
   3. bandwidth derived from system bus architecture
   4. All of these responses are correct.
3. An IPv6 address has length \_\_\_\_\_\_\_\_\_\_\_ bits.
   1. 128
   2. 64
   3. 48
   4. 32
4. ICMP is used only by hosts and routers to communicate network-level information.
   1. True
   2. False
5. In Virtual Circuits \_\_\_\_\_\_\_\_\_\_\_ .
   1. the VC number can be changed on each link
   2. the message path is defined from source to destination
   3. all router forwarding tables must be defined with proper VC number entries
   4. All of these responses are correct.
6. In routers that use bus based switching, the switching speed is limited by the bus bandwidth.
   1. True
   2. False
7. Network layer services and protocols \_\_\_\_\_\_\_\_\_\_\_\_\_\_ .
   1. are provided in hosts and routers
   2. provide communication between system processes running on different hosts
   3. make more than one transport protocol available to applications
   4. All of the above responses are correct.
8. In TCP, congestion control is handled by \_\_\_\_\_\_\_\_\_\_\_\_\_ .
   1. Increasing CongWin by one message size every round trip time
   2. Decreasing CongWin by one-half after each message loss
   3. Exponentially increasing the rate of sending messages until losses occur
   4. Both A and B responses above are correct
9. ATM based ABR provides that \_\_\_\_\_\_\_\_\_\_\_\_\_ .
   1. the network gives a “plastic” service
   2. senders be throttled to the minimum guaranteed rate
   3. senders be throttled to the maximum guaranteed rate
   4. Both A and C responses are correct
10. In forwarding, the router determines the route taken by packets from source to destination.
    1. True
    2. False
11. Head-of-the-line blocking can occur in router \_\_\_\_\_\_\_\_\_\_\_ .
    1. can occur in router output queues
    2. can occur in router input queues
    3. can lead to output buffer overflow
    4. Both B and C responses are correct.
12. An ATM network layer service model that guarantees a bandwidth rate, packet ordering and congestion feedback is \_\_\_\_\_\_\_\_\_\_\_ .
    1. ABR – available bit rate
    2. VBR – variable bit rate
    3. UBR – unspecified bit rate
    4. CBR – constant bit rate
13. An IP address consists of \_\_\_\_\_\_\_\_\_\_\_ .
    1. a host part in high order bits and a subnet part in low order bits
    2. a subnet part in high order bits and a host part in low order bits
    3. a fixed length subnet part chosen by the host
    4. None of these responses are correct.
14. A host may obtain an IP address \_\_\_\_\_\_\_\_\_\_\_ .
    1. only after it has been hard-coded by a system administrator in a file
    2. by dynamically requesting one from a suitable server
    3. by purchasing one from ICAN
    4. Both A and B responses are correct.
15. Current generation routers use \_\_\_\_\_\_\_\_\_\_\_ .
    1. bus based switching
    2. memory based switching
    3. interconnection network based switching
    4. Both A and C responses are correct.
16. Virtual circuit networks require call setup at the network layer.
    1. True
    2. False
17. In Virtual Circuits \_\_\_\_\_\_\_\_\_\_\_ .
    1. it is required to uniquely allocate bandwidth and router buffers at call setup
    2. every router on the source-destination path maintains “state” for each passing connection
    3. each packet carries the destination host address
    4. All of these responses are correct.
18. In datagram networks packets between the same source-destination pair may take different paths.
    1. True
    2. False
19. In the IP address format a.b.c.d/x, the term x is \_\_\_\_\_\_\_\_\_\_\_ .
    1. an unknown quantity to be determined by routing algorithms
    2. the number of bits in the host portion of the address
    3. the number of bits in the subnet portion of the address
    4. None of these responses are correct.
20. In datagram networks the time a datagram spends in a router buffer is controlled by the round trip time.
    1. True
    2. False
21. IP fragmentation occurs due to different network link types with different maximum transfer units.
    1. True
    2. False
22. The responsibility for managing localized needs for assigning IP addresses is given to internet service providers.
    1. True
    2. False
23. Before changing local network IP address, it is necessary to advise the ISP of the changes.
    1. True
    2. False
24. Network address translation is used \_\_\_\_\_\_\_\_\_\_\_ .
    1. to establish local autonomy over IP address management
    2. to increase security by rendering devices inside the network invisible to the outside
    3. in conjunction with a mapping table on the NAT router
    4. All of these responses are correct.
25. An IPv6 datagram header has the size \_\_\_\_\_\_\_\_\_\_\_ bytes.
    1. 16
    2. 20
    3. 40
    4. 48
26. In IPv4 a checksum is included in the header, based on the full datagram.
    1. True
    2. False
27. When too many sources send too much data too fast for the network to handle, it is called \_\_\_\_\_\_\_\_\_\_\_\_.
    1. unreliability
    2. flow control
    3. traffic delay
    4. congestion
28. In TCP, a segment should be retransmitted when \_\_\_\_\_\_\_\_\_\_ .
    1. ACKs are received before timeout
    2. ACKs are not received
    3. when more than one ACK is received for the same segment
    4. All of these responses are correct.
29. Network address translation violates the end-to-end argument for each layer to be peermatched between sender and receiver.
    1. True
    2. False
30. TCP flow control is provided by \_\_\_\_\_\_\_\_\_\_\_\_ .
    1. keeping out-of-order segments in the receiver buffer
    2. including value of the receiver buffer available size in acknowledgements
    3. keeping the send rate always less than the receive rate
    4. All of these responses are correct.
31. Assuming that two senders and two receivers are connected through a common router with an infinite buffer, it is impossible for congestion to arise.
    1. True
    2. False
32. Two indicators of congestion in TCP are long delays and lost packets.
    1. True
    2. False
33. Closing a TCP connection requires one FIN/ACK message exchange.
    1. True
    2. False
34. The act of carrying IPv6 as payload in IPv4 datagrams among IPv4 routers is called \_\_\_\_\_\_\_\_\_\_ .
    1. tunneling
    2. differential routing
    3. protocol extraction
    4. disassembly
35. The network layer service model for Internet provides \_\_\_\_\_\_\_\_\_\_\_\_\_ .
    1. best effort with congestion detection
    2. best effort with congestion inferred through packet loss
    3. no guarantees regarding loss or timing, but guarantees of order
    4. guarantees regarding minimum bandwidth
36. A packet belonging to a virtual circuit carries both the VC number and the destination address.
    1. True
    2. False
37. RIP, OSPF and BGP are examples of \_\_\_\_\_\_\_\_\_\_\_ .
    1. port matching algorithms (or protocols)
    2. link forwarding algorithms (or protocols)
    3. routing algorithms (or protocols)
    4. None of these responses are correct.
38. After establishing a connection, but before exchanging data segments in TCP, it is necessary to initialize \_\_\_\_\_\_\_\_\_\_ .
    1. sequence numbers
    2. RcvWindow
    3. receiving rate at server
    4. Both A and B are correct.
39. Network layer protocols must exist in every host and router.
    1. True
    2. False
40. The size of the TCP receive window (RcvWindow) stays constant throughout the duration of the connection.
    1. True
    2. False
41. TCP utilizes \_\_\_\_\_\_\_\_\_\_\_\_\_\_ congestion control.
    1. router feedback based
    2. server inferred
    3. network assisted
    4. end-to-end
42. Router forwarding tables use longest prefix matching \_\_\_\_\_\_\_\_\_\_\_ .
    1. to map IP addresses to VC numbers
    2. to define link interfaces between routers
    3. to avoid the necessity of managing tables with 232 entries
    4. All of these responses are correct.
43. In an IPv4 datagram of total length 4096 bytes, the maximum size of the data payload is \_\_\_\_\_\_\_\_\_\_\_ .
    1. 4096 bytes
    2. 4076 bytes
    3. 4056 bytes
    4. most often, less than 4056 bytes due to application layer overhead
44. Once an IPv4 datagram has been fragmented at a particular router, it is reassembled only when it reaches its final destination.
    1. True
    2. False
45. One cost of congestion is that \_\_\_\_\_\_\_\_\_\_ .
    1. The network may carry multiple copies of the same packet
    2. Router buffers may require increases in their speed
    3. Packets may need to be retransmitted several times
    4. Upstream transmission capacity is never utilized
46. Datagram networks require call setup at the network layer.
    1. True
    2. False
47. ICMP is used only by hosts to communicate network-level information.
    1. True
    2. False
48. ICMP may be used \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ .
    1. for echo request/reply
    2. to report errors in TCP or UDP message delivery
    3. instead of IP datagrams for carrying messages
    4. Both A and C are correct.
49. Transport services and protocols provide logical communication between hosts.
    1. True
    2. False
50. Network services and protocols provide logical communication between processes.
    1. True
    2. False
51. Transport protocols run in end systems.
    1. True
    2. False
52. Internet transport-layer protocols provide delay and bandwidth guarantees.
    1. True
    2. False
53. In TCP based demultiplexing, TCP sockets are identified by \_\_\_\_\_\_\_\_\_\_\_ .
    1. both sender and receiver port numbers
    2. sender IP address and port numbers
    3. receiver IP address and port number
    4. both sender and receiver IP addresses and port numbers
54. UDP does not provide \_\_\_\_\_\_\_\_\_\_\_\_ .
    1. “no frills,” “bare bones” Internet transport protocol
    2. “best effort” service
    3. handshaking between UDP sender, receiver
    4. congestion control
    5. Both A and B are correct responses
55. In pipelining protocols, the Go-back-N approach requires \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ .
    1. Sender can have up to N unacked packets in pipeline
    2. Receiver acks individual packets
    3. If sender timer expires, retransmit all N packets
    4. Sender has timer for each unacked packet
    5. All of the above responses are correct
56. In order to establish a virtual connection (also called a virtual circuit) that permits datagrams to flow between communicating end hosts, it is necessary to \_\_\_\_\_\_\_\_\_\_\_ .
    1. involve all intervening routers
    2. initiate the connection using specialized datagrams that carry historical information about the end-end route
    3. complete the connection using receiver and sender acknowledgements
    4. All of these responses are correct.
57. Router buffer sizes should be selected based on \_\_\_\_\_\_\_\_\_\_\_\_\_ .
    1. message round-trip time (eg. as determined by acknowledgements)
    2. link capacity
    3. tolerance for data loss due to overflow
    4. All of these responses are correct.
58. The first item in an IP datagram is the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ .
    1. header length (in bytes)
    2. total datagram length (in bytes)
    3. protocol version number
    4. type of service
59. IP datagrams may be fragmented into several smaller IP datagrams \_\_\_\_\_\_\_\_\_\_\_\_\_\_ .
    1. that are reassembled at the next router link
    2. in order to adapt to the largest link layer frame
    3. that are reassembled only at the final destination
    4. Both B and C are correct responses.
60. A router is able to direct a message along its path by examining the destination IP address embedded within a UDP packet.
    1. True
    2. False
61. The IPv4 datagram header has length 40 bytes.
    1. True
    2. False
62. Network layer protocols must be defined in every host and router.
    1. True
    2. False
63. In TCP “slow start”, after establishing the connection, the message flow rate is \_\_\_\_\_\_\_\_\_\_\_ .
    1. increased linearly until first loss event
    2. increased linearly after the first loss event
    3. increased exponentially until first loss event
    4. Both B and C are correct responses.
64. Forwarding refers to \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ .
    1. the manner by which datagrams are routed from source to destination ports of end hosts
    2. the manner by which datagrams are routed from input to output ports of individual routers
    3. the set of algorithms required to ensure near-optimal path selection of datagrams
    4. the control of traffic between communicating routers
65. The “Best effort” service model for Internet traffic provides no guarantees of bandwidth, loss or packet order and, further, requires that the occurrence of congestion must be inferred (ie. derived), rather than determined directly through network feedback.
    1. True
    2. False
66. Assuming that W is the maximum window size established by TCP “slow start”, and the round-trip time is RTT, what is the average throughout of TCP as a function of W and RTT?
    1. RTT/W
    2. 0.5 x W/RTT
    3. 0.75 x W/RTT
    4. 0.75 x RTT/W.
67. Datagram networks do not require call setup at the network layer.
    1. True
    2. False
68. In pure P2P networks, peers may not change IP addresses.
    1. True
    2. False
69. In datagram networks \_\_\_\_\_\_\_\_\_\_\_\_ .
    1. routers maintain state about end-to-end connections
    2. packets forwarded using destination host address and virtual circuit number
    3. packets between same source-destination pair may take different paths
    4. None of these responses is correct.
70. The calculated value of a TCP timeout should \_\_\_\_\_\_\_\_\_\_\_\_ .
    1. be greater than the round-trip time
    2. eliminate unnecessary retransmissions
    3. allow quick reaction to changes in network topology
    4. All of these responses are correct.
71. Round-trip time (RTT) is estimated based on \_\_\_\_\_\_\_\_\_\_ .
    1. a weighted average RTT that is fixed after several samples
    2. a weighted average RTT that is continuously updated
    3. sampling of routes to determine minimum cost paths
    4. None of these responses is correct.
72. The message payload of a UDP segment contains the 4-byte hexadecimal string E666D55516. The UDP checksum of this segment is \_\_\_\_\_\_\_\_\_\_\_ .
    1. BBBB
    2. BBBC
    3. 4443
    4. 4444
73. Flow control is guaranteed to solve congestion problems.
    1. True
    2. False
74. In packet switched networks, store and forward refers to: \_\_\_\_\_\_\_\_\_\_\_\_\_\_ .
    1. entire message must arrive at router before it can be transmitted on next link
    2. scheduling of packets to avoid congestion
    3. entire packet must arrive at router before it can be transmitted on next link
    4. entire packet must be stored on router until acknowledgement received
75. Routers provide feedback to end systems to help in \_\_\_\_\_\_\_\_\_\_\_\_\_\_ .
    1. Network-assisted congestion control
    2. Network-assisted flow control
    3. End-end congestion control
    4. End-end flow control
76. An “elastic” service is one that is capable of providing a range of service delivery adapted to available resources.
    1. True
    2. False
77. Packet switching in the network core leads to \_\_\_\_\_\_\_\_\_\_\_\_\_ .
    1. bandwidth subdivision
    2. resource contention
    3. shared circuit switching
    4. packet loss
78. ATM devices use a packet structure whose size is \_\_\_\_\_\_\_\_\_ bytes .
    1. 20
    2. 48
    3. 53
    4. None of these responses is correct.
79. Delays in packet delivery are usually caused by \_\_\_\_\_\_\_\_\_\_\_ .
    1. queuing in router buffers
    2. overflow in router buffers
    3. retransmission of lost packets
    4. All of these responses are correct.
80. The term “goodput” refers to the situation where \_\_\_\_\_\_\_\_\_\_\_ .
    1. sending rate is larger than receiving rate
    2. sending rate is smaller than receiving rate
    3. sending rate is equal to receiving rate
    4. packet loss occurs, but it is minimized
81. With end-to-end congestion control congestion is inferred from end-system observed loss and delay.
    1. True
    2. False
82. The size of the TCP receive window (RcvWindow) never changes throughout the duration of the connection.
    1. True
    2. False
83. With TCP in the context of client-server connectivity, a disconnection from the session is achieved \_\_\_\_\_\_\_\_\_\_\_ .
    1. When the client sends a FIN control segment to server and the server returns an ACK.
    2. When the client sends a FIN control segment to server and the server returns an ACK followed by a FIN.
    3. When the client sends a FIN control segment to server and the server returns an ACK, followed by the server sending a FIN control segment to client and the client returns an ACK.
    4. None of these responses is correct.
84. In order to establish support for a possible TCP connection session it is necessary for the server side to create a listening socket.
    1. True
    2. False
85. UDP is often used for streaming multimedia apps because \_\_\_\_\_\_\_\_\_\_\_ .
    1. it is loss tolerant
    2. it is rate sensitive
    3. Both A and B responses are correct.
    4. None of these responses is correct.
86. The size of the TCP receive window (RcvWindow) changes throughout the duration of the connection.
    1. True
    2. False
87. The length of a UDP packet header is \_\_\_\_\_\_\_\_\_ bytes.
    1. 4
    2. 8
    3. 12
    4. 16
88. The characteristics of unreliable channels determines the complexity of reliable data transfer protocol.
    1. True
    2. False
89. In the client-server model the time it takes for a server to distribute a file of size F to N clients is \_\_\_\_\_\_\_\_\_\_\_ .
    1. proportional to F
    2. increases linearly with N, for large N
    3. Both A and B responses are correct.
    4. None of these responses is correct.
90. Servers distinguish between multiple connected clients in TCP using \_\_\_\_\_\_\_\_\_\_\_ .
    1. source port numbers
    2. client IP addresses
    3. client side socket numbers
    4. All of these are correct responses.
91. A \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ is a sequence of characters that flow into or out of a process.
    1. pipeline
    2. stream
    3. message flow
    4. socket
92. In client-server programming with UDP \_\_\_\_\_\_\_\_\_\_\_ .
    1. sender explicitly attaches IP address and port of destination to each packet
    2. there is no handshaking
    3. server must extract IP address, port of sender from received packet
    4. All of these responses are correct.
93. Gathering data from multiple sockets and enveloping data with a header is called \_\_\_\_\_\_\_\_\_\_\_ .
    1. segmentation
    2. multiplexing
    3. demultiplexing
    4. integration
94. Transport layer protocols do not provide \_\_\_\_\_\_\_\_\_\_\_ .
    1. logical communication between hosts
    2. delay guarantees
    3. bandwidth guarantees
    4. All of the above responses are correct.
95. Network Address Translation is used because it expands the available device address space through use of port numbers and thereby satisfies the end-to-end argument at the network layer.
    1. True
    2. False
96. Socket API’s provide \_\_\_\_\_\_\_\_\_\_\_ .
    1. unreliable datagram transport service
    2. reliable, byte stream-oriented transport service
    3. Both A and B are correct responses.
    4. None of these responses is correct.
97. A host-local, application-created, OS-controlled interface into which an application process can both send and receive messages to or from another application process is called a(n) \_\_\_\_\_\_\_\_\_\_\_ .
    1. client-server paradigm
    2. peer
    3. socket
    4. protocol
98. In socket programming it may happen that transmitted data may be received out of order, or lost.
    1. True
    2. False
99. An ATM network layer service model that guarantees minimum bandwidth, packet ordering and congestion feedback is \_\_\_\_\_\_\_\_\_\_\_ .
    1. ABR
    2. CBR
    3. UBR
    4. VBR
100. An IP datagram must specify \_\_\_\_\_\_\_\_\_\_\_ .
     1. the length (in bytes) of the payload data
     2. the maximum number of hops the datagram must take
     3. the transport layer protocol to deliver payload to
     4. All of these responses are correct.
101. In pipelining protocols, the selective repeat approach requires \_\_\_\_\_\_\_\_\_\_\_\_\_ .
     1. Receiver only sends cumulative acks
     2. Sender maintains timer for each unacked packet
     3. Receiver acks individual packets
     4. Both B and C responses are correct.
102. In routers, “forwarding” refers to \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ .
     1. the manner by which datagrams are routed from source to destination ports of end hosts
     2. the manner by which datagrams are routed from input to output ports of individual routers
     3. the set of algorithms required to ensure near-optimal path selection of datagrams
     4. the control of traffic between communicating routers
103. TCP flow control is provided by \_\_\_\_\_\_\_\_\_\_\_\_ .
     1. including value of the receiver buffer available size in acknowledgements
     2. keeping out-of-order segments in the receiver buffer
     3. keeping the send rate always less than the receive rate
     4. All of these responses are correct.
104. In pure P2P networks, peers may change IP addresses.
     1. True
     2. False
105. ATM based ABR provides that \_\_\_\_\_\_\_\_\_\_\_\_\_ .
     1. the network gives an “elastic” service
     2. senders be throttled to the minimum guaranteed rate
     3. senders be throttled to the maximum guaranteed rate
     4. Both A and C responses are correct
106. A packet belonging to a virtual circuit carries the destination address.
     1. True
     2. False
107. Neither TCP nor UDP provide delay or bandwidth guarantees.
     1. True
     2. False
108. The IPv4 datagram header has length 20 bytes.
     1. True
     2. False
109. Consider sending a 6000 byte datagram into a link that has a maximum transfer size (MTU) of 1000 bytes. How many fragments are generated?
     1. 5
     2. 6
     3. 7
     4. 8
110. Assume that three routers, U, V and W, have link costs: c(U,V) = 4, c(U,W) = 6 and c(V,W) = 1. Using the Bellman-Ford algorithm, the common routing table for all routers is:

U V W

U 0 4 5

V 4 0 1

W 5 1 0.

* 1. True
  2. False

1. Assume that three routers, U, V and W, have link costs: c(U,V) = 4, c(U,W) = 6 and c(V,W) = 1. Using the Bellman-Ford algorithm, the common routing table for all routers is:

U V W

U 1 4 5

V 4 1 1

W 5 1 1

* 1. True
  2. False

1. Assume that three routers, U, V and W, have link costs: c(U,V) = 3, c(U,W) = 2 and c(V,W) = 10. Using the Bellman-Ford algorithm, the common routing table for all routers is:

U V W

U 0 3 2  
V 3 0 5  
W 2 5 0

* 1. True
  2. False

1. Circuit switched networks require call setup at the network layer.
   1. True
   2. False
2. Before changing local network IP address, it is not necessary to advise the ISP of the changes.
   1. True
   2. False
3. ICMP messages are carried in IP datagrams.
   1. True
   2. False
4. At the network layer, Dijkstra’s algorithm is used to ensure that no redundant packets are received by any node.
   1. True
   2. False
5. In the client-server model the time it takes for a server to distribute a file of size F to N clients is \_\_\_\_\_\_\_\_\_\_\_ .
   1. proportional to F
   2. increases linearly with N, for large N
   3. proportional to F/N
   4. Both A and B responses are correct.
6. An IPv6 network address is specified as a(n) \_\_\_\_\_\_\_\_\_\_ address value.
   1. 4 byte
   2. 10 byte
   3. 16 byte
   4. 20 byte
7. An IPv6 datagram header has length equal to \_\_\_\_\_\_\_\_\_\_ bytes.
   1. 10
   2. 20
   3. 40
   4. 48
8. Using reliable data transfer involves using sequence numbers to deal with \_\_\_\_\_\_\_\_\_ .
   1. duplicate packet transmission
   2. guaranteeing in-order delivery
   3. loss of packets
   4. Both A and C responses are correct.
9. Hosts and routers utilize \_\_\_\_\_\_\_\_ to communicate network-level information.
   1. TCP
   2. UDP
   3. ICMP
   4. SMTP
10. UDP provides unreliable transfer of datagrams between client and server.
    1. True
    2. False
11. In the Go-Back-N approach, the sender \_\_\_\_\_\_\_\_.
    1. retransmits all packets upon expiration of the timer
    2. can have up to N unacked packets in pipeline
    3. has timer for each packet
    4. waits for receiver acknowledgement for each packet sent
12. In the Selective Repeat approach, the sender \_\_\_\_\_\_\_\_.
    1. can have up to N unack’ed packets in pipeline
    2. relies upon receiver acknowledgement for each packet sent
    3. has a timer for each packet sent
    4. All of these responses are correct.
13. Using TCP with rdt3.x, fast retransmit is performed \_\_\_\_\_\_\_\_.
    1. if sender receives 3 ACKs for the same data
    2. if sender receives 2 ACKs for the same data
    3. if sender is unsure about whether the receiver has received a packet
    4. None of these responses is correct.
14. If a router malfunctions, using Link-State protocols, \_\_\_\_\_\_\_\_\_\_\_\_ .
    1. node can advertise incorrect link cost
    2. each node computes only its own table
    3. each node’s table is used by others so error propagates through network
    4. Both A and B are correct responses.
15. The motivation(s) for utilizing Network Address Translation include(s) \_\_\_\_\_\_\_\_\_\_\_ .
    1. making available a range of unique IP addresses for all devices in every subnet
    2. ability to change addresses of devices in local network without notifying outside world
    3. ability to change ISP without changing addresses of devices in global network
    4. establishing direct addressability to local devices inside subnet
16. Multiple TCP streams can distinguished on a given machine using \_\_\_\_\_\_\_\_\_\_ .
    1. Ports
    2. IP addresses
    3. network interface cards
    4. All of the above responses are correct.
17. If Bob and Alice are two peers and each is located behind a Network Address Translation (NAT) server across a wide-area network (WAN) then, in the absence of application-specific NAT configuration, \_\_\_\_\_\_\_\_\_\_\_ .
    1. they can establish a reliable UDP connection
    2. they cannot establish a SMTP connection
    3. they can establish a TCP connection
    4. they cannot establish a TCP connection
18. HTTP is referred to as a stateless protocol because \_\_\_\_\_\_\_\_\_\_\_\_\_ .
    1. clients do not maintain historic information about transactions with servers
    2. servers and clients do not maintain open connections
    3. server maintains no information about past client requests
    4. All of the above responses are correct
19. Which layer has the responsibility of transferring datagrams from one node to adjacent node(s) over a link?
    1. Application layer
    2. Transport layer
    3. Link layer
    4. Network layer
20. By using Web caching \_\_\_\_\_\_\_\_\_\_\_\_\_\_ .
    1. it is possible to reduce response time for client request
    2. it is possible to reduce traffic on an institution’s access link
    3. the cache acts as both client and server
    4. All of the above responses is correct
21. When the link cost increases suddenly between two routers in a network, poisoned reverse is used to \_\_\_\_\_\_\_\_\_\_\_\_\_ .
    1. accelerate the convergence to a stable routing table
    2. replace all update link costs initially to infinity for all routes through the affected routers
    3. guarantee unique routing solutions in the final routing tables
    4. Both A and B responses are correct.
22. Routing algorithms may be classified based on \_\_\_\_\_\_\_\_\_\_\_\_ .
    1. availability of global information
    2. availability of local information
    3. rate of change of network paths
    4. All of the above responses are correct.
23. A subnet may be defined as any interconnected set of computers and routers (or switches) that can operate in isolation from other subnets, or in cooperation with other subnets.
    1. True
    2. False
24. The IP service model is a \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ delivery service.
    1. guarantee
    2. reliable
    3. best-effort
    4. None of the options above is a valid response
25. Network address translation satisfies the end-to-end argument for each layer to be peermatched between sender and receiver.
    1. True
    2. False
26. IP datagrams may be defragmented into several smaller IP datagrams \_\_\_\_\_\_\_\_\_\_\_\_\_\_ .
    1. that are reassembled at the next router link
    2. in order to adapt to the smallest link layer frame
    3. that are reassembled only at the final destination
    4. Both B and C options above are correct responses
    5. None of the options above is valid
27. Head-of-the-line blocking \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ .
    1. can occur in router output queues
    2. can occur in router input queues
    3. can lead to output buffer overflow
    4. Both B and C responses are correct.
28. A transport layer protocol provides for logical communication between \_\_\_\_\_\_\_\_\_\_\_\_ .
    1. Hosts
    2. Processes
    3. Routers
    4. NIC’s
    5. None of the options above is a valid response
29. TCP strives to give each connection traversing a congested link an equal share of the link's bandwidth. This service by TCP is known as \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.
    1. congestion control
    2. bandwidth control
    3. equal-opportunity
    4. multiplexing
    5. All of the responses above are valid
30. Port numbers in the range 0 - 1023 are known as \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ .
    1. small port numbers
    2. destination port numbers
    3. source port numbers
    4. well-known port numbers
31. As segments arrive from the network, a destination host directs each segment to the appropriate socket by examining the destination port number. This process is known as \_\_\_\_\_\_\_\_\_\_\_\_\_ .
    1. multiplexing
    2. de-multiplexing
    3. routing
    4. segmenting
32. The maximum amount of data that can be placed in a segment is limited by the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ .
    1. maximum bandwidth
    2. protocol used
    3. maximum segment size
    4. maximum transmission unit
33. A checksum is used to provide \_\_\_\_\_\_\_\_\_\_\_\_\_\_ .
    1. arithmetic totals
    2. error correction
    3. congestion control
    4. error detection
34. Protocols are not required to govern communication activity in the Internet.
    1. True
    2. False
35. When an acknowledgement for client-to-server data is carried in a segment carrying server-to-client data, the acknowledgement is said to be \_\_\_\_\_\_\_\_\_\_\_\_\_\_ on the serverto-client segment.
    1. acknowledged
    2. segmented
    3. piggybacked
    4. multi-tasked
36. The \_\_\_\_\_\_\_\_\_\_\_\_\_\_ imposes a constraint on the rate at which a TCP sender can send traffic into the network.
    1. congestion indicator
    2. congestion window
    3. bandwidth probe
    4. choke packet
37. Which of the following is not a component of a route?
    1. Switching ports
    2. Switching fabric
    3. Output ports
    4. Input ports
38. In the datagram format for IPv4, the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ field is included to ensure that datagrams do not circulate forever in the network.
    1. options
    2. time-to-live
    3. protocol version
    4. destination
39. IPv6 has \_\_\_\_\_\_\_\_\_\_\_\_\_-bit addresses.
    1. 32
    2. 64
    3. 128
    4. variable-length
40. Which protocol is used in order to configure IP addresses automatically?
    1. ARP
    2. DHCP
    3. ICMP
    4. RARP
41. What is the TCP response to a timeout event?
    1. sending the next packet
    2. retransmitting the segment that caused the timeout
    3. restarting the connection and establishing a new connection
    4. None of the options above is valid.
42. How long does it take to transmit 8000 bits in a 1Gbps link?
    1. 25 ms
    2. 8 ms
    3. 80 ms
    4. 250 ms
43. In IPv4, the IP address expressed in binary notation as

00001010 00000000 00000001 00000010

can be written in dotted-decimal notation as \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ .

* 1. 2.0.1.1
  2. 101.0.0.10
  3. 10.0.1.2
  4. 10.1.0.101

1. To better manage the network, Network Administrators usually divide a single network into \_\_\_\_\_\_\_\_\_\_\_ by allocating ranges of IP addresses within the network.
   1. islands
   2. subnets
   3. groups
   4. LANs
2. \_\_\_\_\_\_\_\_\_\_\_\_\_\_ is used to extend the use of the limited IPv4 address space.
   1. DHCP
   2. DNS
   3. TTL
   4. NAT
   5. ICMP
3. Which of the following options does hide the details of the home network from the Internet?
   1. ARP
   2. DHCP
   3. ICMP
   4. NAT
4. In circuit switching networks, which of the following options is true?
   1. Transmission rate cannot be guaranteed.
   2. The resources needed along a path are reserved.
   3. Uses the resources on demand.
   4. A and B responses are both correct.
5. \_\_\_\_\_\_\_\_\_\_\_\_\_\_ delay is the result when packets wait to be transmitted onto the next link.
   1. Queuing
   2. Transmission
   3. Propagation
   4. Nodal processing
6. Which option below keeps track of users?
   1. TCP
   2. Cookie
   3. Socket
   4. All of the responses above are correct.
7. Which one is correct about HTTP and SMTP?
   1. both transfer files
   2. both use UDP
   3. both use TCP
   4. A and C are both correct responses.
8. Which of the following options show the correct name for a packet of information in each layer?
   1. application layer: frame, Transport layer: segment, Network layer: datagram, Link layer: message
   2. application layer: message, Transport layer: frame, Network layer: datagram, Link layer: segment
   3. application layer: message, Transport layer: segment, Network layer: datagram, Link layer: frame
   4. None of the responses above is correct.
9. Suppose one client sends a packet with SYN=1, seq= 1000 to a server. What is the value of SYN and seq in response packet?
   1. SYN = 0 ; seq = 1000
   2. SYN = 0; seq = 1001
   3. SYN = 1; seq = 1001
   4. SYN =1; seq = 1000
10. The type of domain that deals with edu, com, net, org, and other similar extensions, is called a \_\_\_\_\_\_\_\_\_\_\_\_ .
    1. Root DNS server
    2. Top-level DNS server
    3. Authoritative DNS server
    4. Local DNS server
11. Which one is not a service provided by DNS?
    1. translating host names
    2. Mail server aliasing
    3. load distribution
    4. congestion control
12. Which of the options uses a P2P protocol?
    1. POP3
    2. DNS
    3. HTTP
    4. BitTorrent
13. Internet protocols define \_\_\_\_\_\_\_\_\_\_ .
    1. format of messages
    2. actions taken on message transmission and receipt
    3. order of messages sent and received among network entities
    4. All of the responses above are correct
14. Ethernet is \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ .
    1. One of the physical media
    2. One of the LAN technologies
    3. One of the WAN technologies
    4. A client-server network
15. SSL was added as an enhancement to TCP in order to provide process-to-process security.
    1. True
    2. False
16. Which of the following is a proper layer of the TCP/IP stack?
    1. Session
    2. Network
    3. Transport
    4. Presentation
    5. B and C are both correct.
17. Packet delay may be caused by \_\_\_\_\_\_\_\_\_\_\_\_\_\_ .
    1. time required for nodal processing requirements
    2. time required for queueing
    3. transmission and propagation times
    4. All of these responses are correct.
18. The IETF is responsible for \_\_\_\_\_\_\_\_\_\_ .
    1. creating new Internet protocols
    2. ensuring that the Internet is operating correctly
    3. setting Internet standards
    4. approving new Internet Service Providers
19. A network’s speed is expressed in terms of \_\_\_\_\_\_\_\_\_\_\_\_ .
    1. Routing protocol
    2. Round trip time
    3. Bit rate and latency
    4. I/O buffer response
    5. Delay and Routing
20. Photonic (ie. optical) networks utilize \_\_\_\_\_\_\_\_\_\_\_\_ switches.
    1. LAN
    2. TCP/IP
    3. CBR
    4. analog
    5. ATM
21. With download and delete, after a user retrieves its messages from a POP server \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.
    1. The user may retrieve all their messages later on any machine
    2. The user may retrieve only some of their messages later on any machine
    3. The messages are deleted immediately after reading them
    4. The messages are saved for only a limited period of time, then deleted
    5. None of the responses above are correct.
22. Which layer is in charge of flow control?
    1. Application
    2. Network
    3. Physical
    4. Transport
23. With GoBackN, it is possible for the sender to receive an ACK for a packet that falls outside of its current window.
    1. True
    2. False
24. The time it takes for a small packet to travel from client to server and then back to the client is called \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ .
    1. Round-trip time
    2. Propagation time
    3. Transmission time
    4. Delay time
25. Which of the following options control the sending and receiving of information within the Internet?
    1. protocols
    2. packets
    3. ISP
    4. RFC
26. HTTP response messages may have an empty message body.
    1. True
    2. False
27. Packet switching in the network core inevitably leads to \_\_\_\_\_\_\_\_\_\_\_\_\_ .
    1. bandwidth subdivision
    2. packet loss
    3. shared circuit switching
    4. resource contention
28. All datagrams contain 2 ports.
    1. True
    2. False
29. Message encapsulation refers to \_\_\_\_\_\_\_\_\_\_ .
    1. designating message contents with descriptive data
    2. allowing for message content verification
    3. reliance upon IP for transmitting messages
    4. embedding payloads and protocol headers within logically layered packages
30. Transfer across TCP streams is \_\_\_\_\_\_\_\_\_\_\_\_ .
    1. half duplex
    2. full duplex
    3. best available duplex
    4. None of the responses above is correct.
31. A DNS resource record is a tuple that contains \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ .
    1. Name, Value
    2. Name, Value, Type
    3. Name, Value, Time-to-live
    4. Name, Type, Time-to-live
    5. Name, Value, Type, Time-to-live
32. TCP abstracts data communication to appear as an apparent stream of flowing data.
    1. True
    2. False
33. Which option describes the server program in a connection-oriented transport service?
    1. Create socket and then, in a loop, wait for incoming connection request, read request, write reply, then close
    2. Create socket, send request, read reply, close
    3. Create socket, read request, write reply
    4. Create socket, send request, read reply, close
34. What is a Distributed Hash Table (DHT)?
    1. A Server side searching table.
    2. It is used in DNS.
    3. An indexing and searching technique for a P2P network.
    4. None of the responses above is correct.
35. Both UDP and TCP require that the applications recognize their own data formats.
    1. True
    2. False
36. The socket that represents a ‘passive open’ is a(n) \_\_\_\_\_\_\_\_ socket.
    1. Server
    2. Client
    3. TCP
    4. Application
37. Interconnected routers in the Internet exist \_\_\_\_\_\_\_\_\_\_ .
    1. within access networks
    2. in the network core, as a network of networks
    3. on the network edge
    4. None of these responses is correct
38. Transport services and protocols \_\_\_\_\_\_\_\_\_\_\_\_\_\_ .
    1. provide communication between system processes running on different hosts
    2. are provided in hosts and routers
    3. make more than one transport protocol available to applications
    4. All of the above responses are correct
39. Packet loss \_\_\_\_\_\_\_\_\_\_\_\_\_\_ .
    1. may be dealt with by retransmitting packets, or ignoring them completely
    2. may be reduced or eliminated by expanding hardware buffers
    3. is not a problem with current technologies
    4. Both A and B responses are correct.
    5. None of these responses is correct.
40. Switching may be accomplished using \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ .
    1. memory
    2. bus
    3. crossbar
    4. All of the above responses are correct
41. Head-of-the-line blocking occurs only at the input port.
    1. True
    2. False
42. The \_\_\_\_\_\_\_\_\_\_ is defined as the fraction of time the sender is actually busy sending bits into the channel.
    1. utilization
    2. capacity
    3. efficiency
    4. None of these responses is correct.
43. TCP strives to give each connection traversing a link an equal share of the link's bandwidth. This service by TCP is known as \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.
    1. congestion control
    2. bandwidth control
    3. equal-opportunity
    4. None of these responses is correct.
44. IP service model is a \_\_\_\_\_\_\_\_\_\_\_\_\_\_ delivery service.
    1. guaranteed
    2. reliable
    3. best-effort
    4. None of these responses is correct.
45. In a receiving host, data is delivered from the transport layer to processes through an intermediary \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ .
    1. port
    2. socket
    3. IP address
    4. None of these responses is correct.
46. To maintain the EstimatedRTT of the SampleRTT’s, TCP uses the \_\_\_\_\_\_\_\_\_\_\_\_\_ of the SampleRTT’s.
    1. weighted average
    2. minimum
    3. maximum
    4. average of the maximum and minimum
47. IPv6 has \_\_\_\_\_\_-bit addresses.
    1. 32
    2. 64
    3. 128
    4. variable length
    5. None of these responses is correct.
48. Slow start and congestion avoidance are mandatory in TCP congestion-control algorithm.
    1. True
    2. False
49. The \_\_\_\_\_\_\_\_\_\_\_\_\_\_ protocol is used for error reporting in the network layer.
    1. TCP
    2. checksum
    3. SMTP
    4. ICMP
    5. IPsec
50. Which of the following is correct about TCP?
    1. provides full-duplex service
    2. provides point-to-point connection
    3. starts the connection using three-way handshake
    4. All of the responses above are correct.
51. Window size in TCP is used to avoid congestion within the IP network
    1. True
    2. False
52. A(n) \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ is used to formulate routing problems.
    1. algorithm
    2. graph
    3. routing table
    4. All of the responses above are correct.
53. Which option best describes the server program in a connection-oriented transport service?
    1. Create socket and then, in a loop, wait for incoming connection request, read request, write reply, then close
    2. Create socket, send request, read reply, close
    3. Create socket, read request, write reply
    4. Create socket, send request, read reply, close
54. IP service model is based on a \_\_\_\_\_\_\_\_\_\_\_\_\_\_ delivery service.
    1. guaranteed
    2. reliable
    3. best-effort
    4. None of these responses is correct.
55. In a receiving host, data is delivered from the transport layer to processes through an intermediary \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ .
    1. port
    2. socket
    3. IP address
    4. None of these responses is correct.
56. The \_\_\_\_\_\_\_\_\_\_\_\_\_\_ protocol is used for error reporting in the network layer.
    1. TCP
    2. checksum
    3. SMTP
    4. ICMP
    5. IPsec
57. Window size in TCP is used to avoid congestion within the IP network
    1. True
    2. False
58. ICMP (Internet Control Message Protocol) messages are carried in IP datagrams.
    1. True
    2. False
59. Which of the following is correct about TCP?
    1. provides full-duplex service
    2. provides point-to-point connection
    3. starts the connection using three-way handshake
    4. All of the responses above are correct.
60. If a router malfunctions, using Distance-Vector protocols, \_\_\_\_\_\_\_\_\_\_\_\_ .
    1. node can advertise incorrect path cost
    2. each node computes only its own table
    3. corrective actions occur immediately to isolate the error
    4. Both A and B are correct responses.
61. To maintain the EstimatedRTT of the SampleRTT’s, TCP uses the \_\_\_\_\_\_\_\_\_\_\_\_\_ of the SampleRTT’s.
    1. weighted average
    2. minimum
    3. maximum
    4. average of the maximum and minimum
62. Network layer protocols must be defined in every router.
    1. True
    2. False
63. Network services and protocols provide logical communication between hosts.
    1. True
    2. False
64. A datagram network provides network-layer \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ service.
    1. connectionless
    2. connection
    3. core implementation dependent
    4. None of the responses above is correct.
65. Router buffer sizes should be selected based on \_\_\_\_\_\_\_\_\_\_\_\_\_ .
    1. message round-trip time
    2. link capacity
    3. tolerance for data loss due to overflow
    4. All of the responses above are correct.
66. The IPv6 datagram header has length \_\_\_\_\_\_\_\_\_\_\_\_ bytes.
    1. 20
    2. 40
    3. 32
    4. 128
67. RIP, OSPF and BGP are examples of \_\_\_\_\_\_\_\_\_ .
    1. application layer routing protocols
    2. transport layer routing protocols
    3. network layer routing protocols
    4. Both B and C responses are correct.