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Question 1 [5 Marks]

A packet whose destination is outside the local TCP/IP network segment is sent to:

A. File Server
B. DNS Server
C. DHCP Server
✓ Default Gateway

Explanation
A packet whose destination is outside the local TCP/IP network segment is sent to the default gateway.

Your submitted response was correct.

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Question 2 [5 Marks]

The message 11001001 is to be transmitted using the CRC polynomial $x^3 + 1$ to protect it from errors. The message that should be transmitted is:

A. 11001001000
✓ 11001001011
C. 11001010
D. 110010010011

Explanation
The polynomial x^3+1 corresponds to divisor is 1001.

```
11001001 000  <--- input right padded by 3 bits

1001          <--- divisor

01011001 000  <---- XOR of the above 2
```

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Question 3 [5 Marks]

The distance between two stations M and N is L kilometers. All frames are K bits long. The propagation delay per kilometer is t seconds. Let R bits/second be the channel capacity. Assuming that processing delay is negligible, the minimum number of bits for the sequence number field in a frame for maximum utilization, when the sliding window protocol is used, is:

(A) $\left\lceil \log_2 \frac{2LtR + 2K}{K} \right\rceil$

(B) $\left\lceil \log_2 \frac{2LtR}{K} \right\rceil$

(C) $\left\lceil \log_2 \frac{2LtR + K}{K} \right\rceil$

(D) $\left\lceil \log_2 \frac{2LtR + K}{2K} \right\rceil$

A A

B B

✓ C

D D

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Question 4 [5 Marks]

Consider the store and forward packet switched network given below. Assume that the bandwidth of each link is 10^6 bytes/sec. A user on host A sends a file of size 10^3 bytes to host B through routers R1 and R2 in three different ways. In the first case a single packet containing the complete file is transmitted from A to B. In the second case, the file is split into 10 equal parts, and these packets are transmitted from A to B. In the third case, the file is split into 20 equal parts and these packets are sent from A to B. Each packet contains 100 bytes of header information along with the user data. Consider only transmission time and ignore processing, queuing and propagation delays. Also, assume that there are no errors during transmission. Let T1, T2, and T3 be the times taken to transmit the file in the first, second and third cases respectively. Which one of the following is CORRECT?

A T1 < T2 < T3

B T1 > T2 > T3

C T2 = T3, T3 < T1

✓ T1 = T3, T3 > T2

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Question 5 [5 Marks]

Data transmitted on a link use the following 2D parity scheme for error detection: Each sequence of 28 bits is arranged in a 4×7 matrix (rows r_0 through r_3, and columns d_7 through d_1) and is padded with a column d_0 and row r_4 of parity bits computed using the Even parity scheme. Each bit of column d_0 (respectively, row r_4) gives the parity of the corresponding row (respectively, column). These 40 bits are transmitted over the data link.

	d_7	d_6	d_5	d_4	d_3	d_2	d_1	d_0
r_0	0	1	0	1	0	0	1	1
r_1	1	1	0	0	1	1	1	0
r_2	0	0	0	1	0	1	0	0
r_3	0	1	1	0	1	0	1	0
r_4	1	1	0	0	0	1	1	0

A 1

B 2

✓ 3

D 4

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Question 6 [5 Marks]

In a packet switching network, if the message size is 48 bytes and each packet contains a header of 3 bytes. If 24 packets are required to transmit the message, the packet size is:

A 2 bytes

B 1 byte

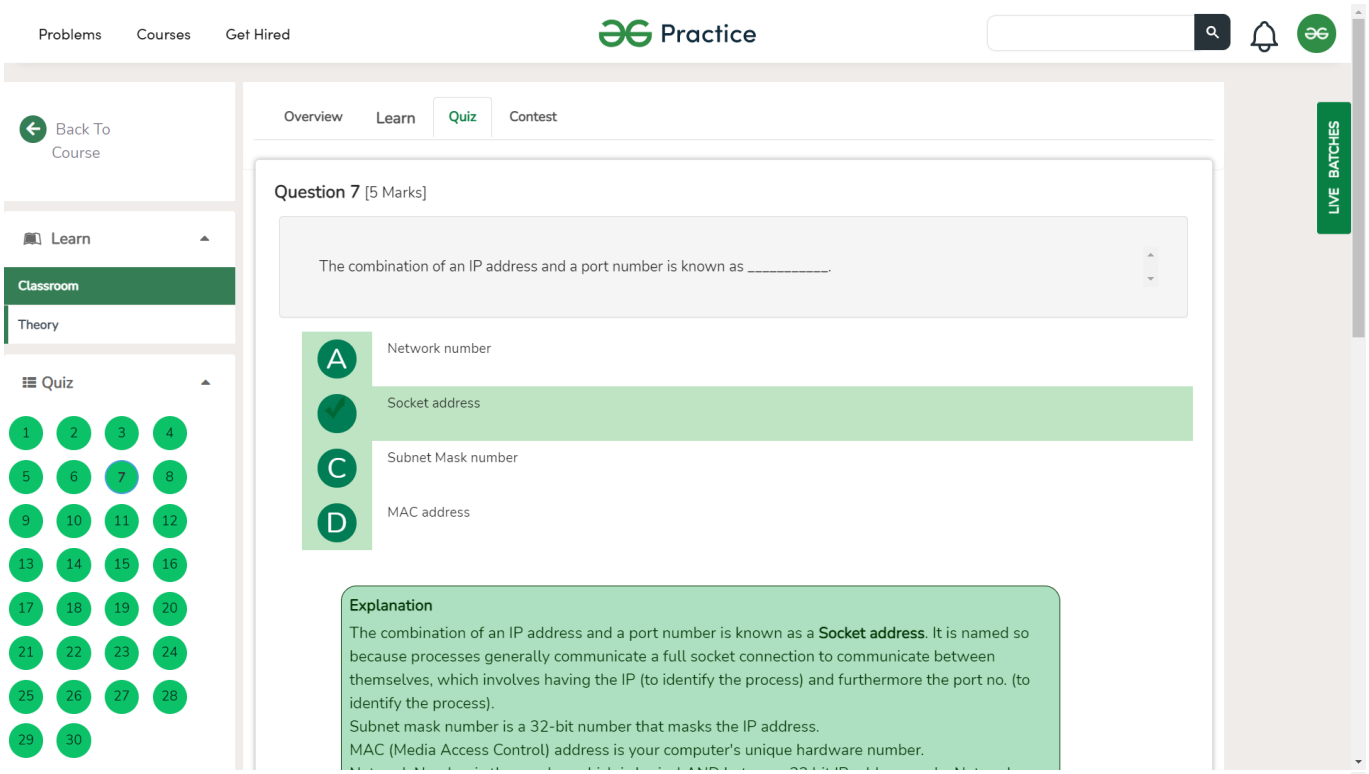
C 4 bytes

✓ 5 bytes

Explanation

There are 24 packets and 48 bytes of data, So 48 / 24 = 2-byte data for each packet. The header size is 3 byte 2 + 3 = 5 byte will be the size of the data packet.

Your submitted response was correct.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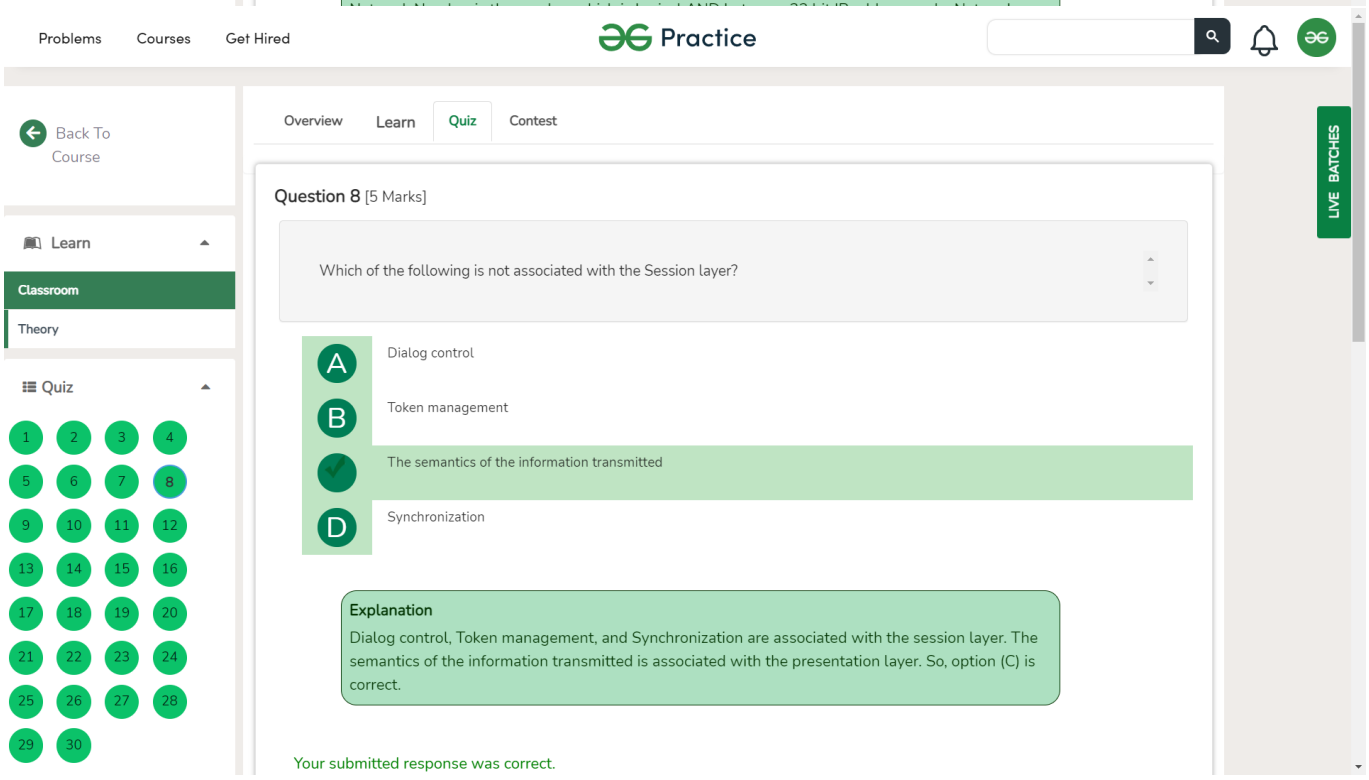
Question 7 [5 Marks]
The combination of an IP address and a port number is known as _____.
A Network number
Socket address
C Subnet Mask number
D MAC address
Explanation
The combination of an IP address and a port number is known as a Socket address. It is named so because processes generally communicate a full socket connection to communicate between themselves, which involves having the IP (to identify the process) and furthermore the port no. (to identify the process).
Subnet mask number is a 32-bit number that masks the IP address.
MAC (Media Access Control) address is your computer's unique hardware number.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Question 8 [5 Marks]
Which of the following is not associated with the Session layer?
A Dialog control
B Token management
The semantics of the information transmitted
D Synchronization
Explanation
Dialog control, Token management, and Synchronization are associated with the session layer. The semantics of the information transmitted is associated with the presentation layer. So, option (C) is correct.
Your submitted response was correct.

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Question 9 [5 Marks]

Which of the following is a MAC address?

A. 192.166.200.50

B. 00056A:01A01A5CCA7FF60

C. 568, Airport Road

✓ 01:A5:BB:A7:FF:60

Your submitted response was correct.

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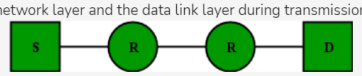
Question 10 [5 Marks]

Assume that source S and destination D are connected through two intermediate routers labeled R. Determine how many times each packet has to visit the network layer and the data link layer during transmission from S to D.



A. Network layer - 4 times and Data link layer - 4 times

B. Network layer – 4 times and Data link layer – 3 times

✓ Network layer – 4 times and Data link layer – 6 times

D. Network layer – 2 times and Data link layer – 6 times

Explanation

The router is a network layer device. See the following diagram:

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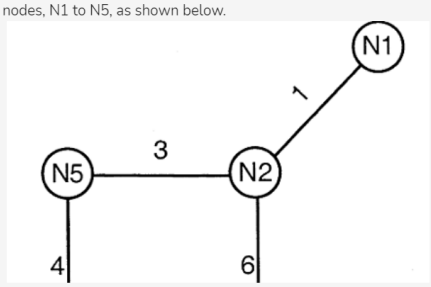
Question 11 [5 Marks]

Consider a network with five nodes, N1 to N5, as shown below.



✓ (3, 2, 0, 2, 5)

B (3, 2, 0, 2, 6)

C (7, 2, 0, 2, 5)

(7, 2, 0, 2, 6)

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Question 12 [5 Marks]

Host A (on TCP/IP v4 network A) sends an IP datagram D to host B (also on TCP/IP v4 network B). Assume that no error occurred during the transmission of D. When D reaches B, which of the following IP header field(s) may be different from that of the original datagram D?

1. TTL
2. Checksum
3. Fragment Offset

A 1 only

B 1 and 2 only

C 2 and 3 only

✓ 1, 2 and 3

Explanation

All of them may get changed:

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Question 13 [5 Marks]

Classless Inter-domain Routing (CIDR) receives a packet with address 131.23.151.76. The router's routing table has the following entries:

```
Prefix          Output Interface Identifier
131.16.0.0/12             3

131.28.0.0/14             5

131.19.0.0/16             2

131.22.0.0/15             1
```

The identifier of the output interface on which this packet will be forwarded is:

✓ 1

B 2

C 3

5

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Question 14 [5 Marks]

Two computers C1 and C2 are configured as follows. C1 has IP address 203.197.2.53 and netmask 255.255.128.0. C2 has IP address 203.197.75.201 and netmask 255.255.192.0. which one of the following statements is true?

A C1 and C2 both assume they are on the same network.

B C2 assumes C1 is on the same network, but C1 assumes C2 is on a different network.

✓ C1 assumes C2 is on the same network, but C2 assumes C1 is on a different network.

D C1 and C2 both assume they are on different networks.

Explanation

Network Id of C1 = bitwise '&' of IP of C1 and subnet mask of C1
= (203.197.2.53) & (255.255.128.0)
= 203.197.0.0
C1 sees network ID of C2 as bitwise '&' of IP of C2 and subnet mask of C1
= (203.197.75.201) & (255.255.128.0)

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Question 15 [5 Marks]

Station A needs to send a message consisting of 9 packets to Station B using a sliding window (window size 3) and go-back-n error control strategy. All packets are ready and immediately available for transmission. If every 5th packet that A transmits gets lost (but no acks from B ever get lost), then what is the number of packets that A will transmit for sending the message to B?

A. 12
B. 14
✓ 16
D. 18

Explanation

Total of 16 packets are sent. See the following table for the sequence of events. Since the go-back-n error control strategy is used, all packets after a lost packet are sent again.

```
Sender      Receiver
```

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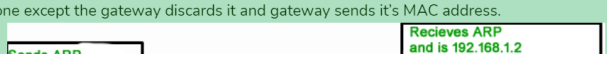
Question 16 [5 Marks]

The address resolution protocol (ARP) is used for:

A. Finding the IP address from the DNS.
B. Finding the IP address of the default gateway.
C. Finding the IP address that corresponds to a MAC address.
✓ Finding the MAC address that corresponds to an IP address.

Explanation

When a packet is passed to the data link layer from the network layer IP address of the sender, the MAC address of the sender and the gateway of the network is attached. The MAC address of the sender is known to the sender but not the MAC address of the gateway. So ARP (Address Resolution Protocol) request is generated with the IP address of the gateway and is broadcasted, everyone except the gateway discards it and gateway sends it's MAC address.



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Question 17 [5 Marks]

The routing table of a router is shown below:

Destination	Sub-net Mask	Interface
128.75.43.0	255.255.255.0	Eth0
128.75.43.0	255.255.255.128	Eth1
192.12.17.5	255.255.255.255	Eth3
Default		Eth2

On which interfaces will the router forward packets addressed to destinations 128.75.43.16 and 192.12.17.10 respectively?

✓ Eth1 and Eth2

B Eth0 and Eth2

C Eth0 and Eth3

D Eth1 and Eth3

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Question 18 [5 Marks]

Host X has IP address 192.168.1.97 and is connected through two routers R_1 and R_2 to another host Y with IP address 192.168.1.80. Router R_1 has IP addresses 192.168.1.135 and 192.168.1.110. R_2 has IP addresses 192.168.1.67 and 192.168.1.155. The netmask used in the network is 255.255.255.224.
Given the information above, how many distinct subnets are guaranteed to already exist in the network?

A 1

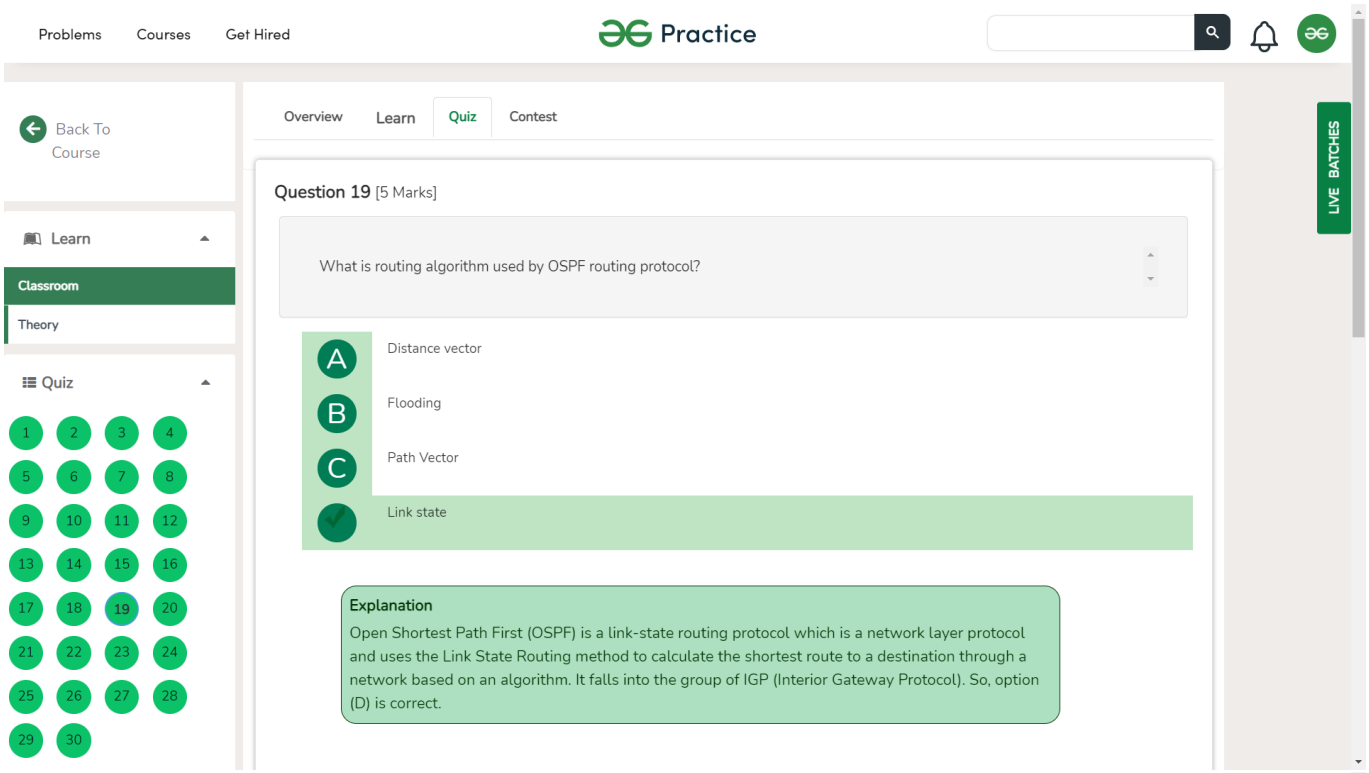
B 2

✓ 3

D 6

Explanation

Given IP addresses are of Class C
Default Mask for class C = 24
Here given mask is 11 bits (11111111 11111111 11111111 11100000)
Subnet ID: 3 bits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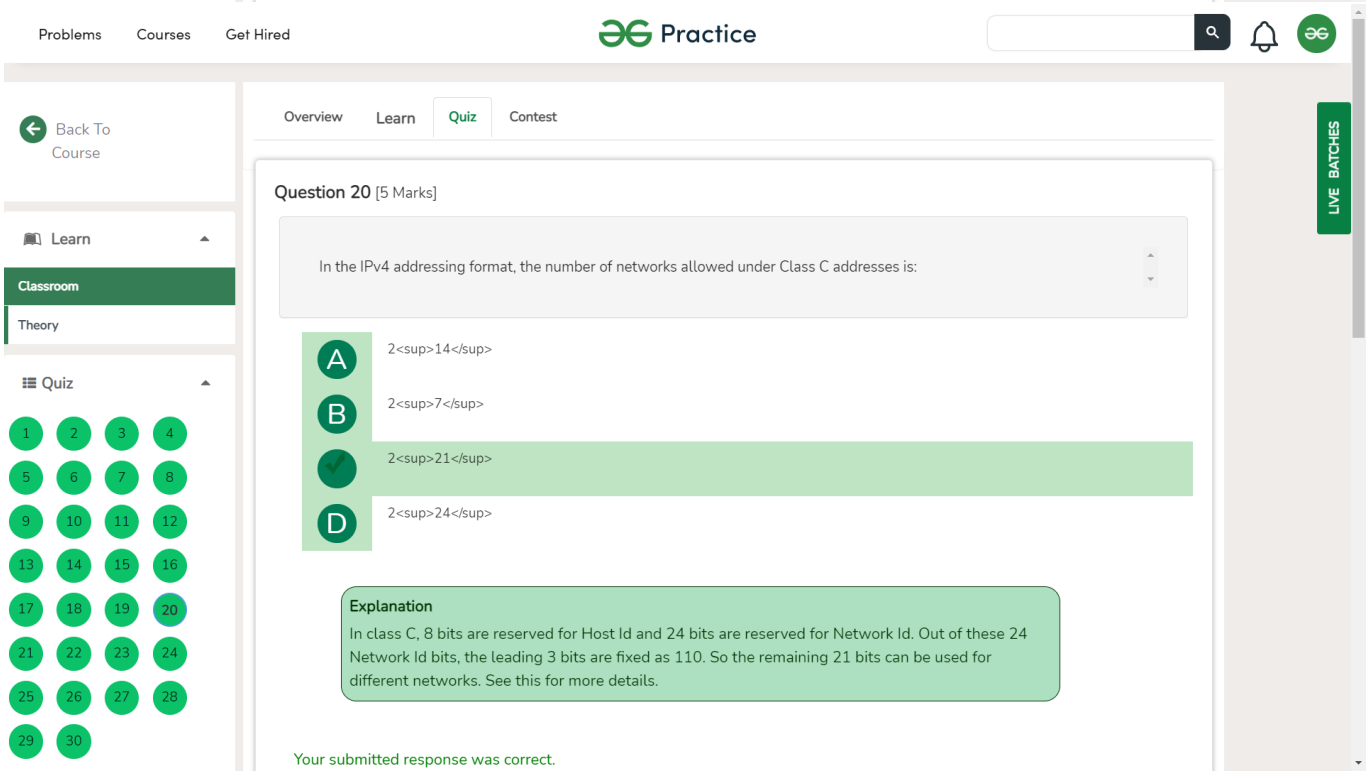
Question 19 [5 Marks]
What is routing algorithm used by OSPF routing protocol?
A Distance vector
B Flooding
C Path Vector
Link state
Explanation
Open Shortest Path First (OSPF) is a link-state routing protocol which is a network layer protocol and uses the Link State Routing method to calculate the shortest route to a destination through a network based on an algorithm. It falls into the group of IGP (Interior Gateway Protocol). So, option (D) is correct.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Question 20 [5 Marks]
In the IPv4 addressing format, the number of networks allowed under Class C addresses is:
A 2¹⁴
B 2⁷
2²¹
D 2²⁴
Explanation
In class C, 8 bits are reserved for Host Id and 24 bits are reserved for Network Id. Out of these 24 Network Id bits, the leading 3 bits are fixed as 110. So the remaining 21 bits can be used for different networks. See this for more details.
Your submitted response was correct.

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Question 21 [5 Marks]

Which of the following can be used as both Source and Destination IP?

A. 198.168.1.255
✓ 10.0.0.1
C. 127.0.0.1
D. 255.255.255.255

Explanation
192.168.1.255 is a Direct Broadcast Address and can't be used as a source/destination address.
127.0.0.1 is the Loop back address which again can't be used as a source/destination address.
255.255.255.255 is the Limited Broadcast Address.
Thus, only 10.0.0.1 can be both used as both source and destination IP addresses.

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Question 22 [5 Marks]

Which one of the following uses UDP as the transport protocol?

A. HTTP
B. Telnet
✓ DNS
D. SMTP

Explanation
UDP is a stateless, connectionless and unreliable protocol. HTTP needs a connection to be established and thus, uses TCP. Telnet is a byte stream protocol which again needs connection establishment, thus uses TCP. DNS needs a request and response, it needs a protocol in which a server can answer the small queries of a large number of users. As UDP is fast and stateless it is the most suitable protocol and thus, it is used in DNS querying. SMTP needs reliability and thus, uses TCP.

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Question 23 [5 Marks]

Which one of the following socket API functions converts an unconnected active TCP socket into a passive socket?

A. connect

B. bind

✓ listen

D. accept

Explanation

listen() marks the socket referred to by **sockfd** as a passive socket, that is, as a socket that will be used to accept incoming connection requests using *accept()*.

Your submitted response was correct.

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Question 24 [5 Marks]

Which of the following statements are TRUE?
1. TCP handles both congestion and flow control.
2. UDP handles congestion but not flow control.
3. Fast retransmit deals with congestion but not flow control.
4. Slow start mechanism deals with both congestion and flow control.

A. 1, 2 and 3 only

✓ 1 and 3 only

C. 3 and 4 only

D. 1, 3 and 4 only

Explanation

1. With the help of TCP window, Flow control is handled and with the help of congestion window, Congestion control is achieved.

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Question 25 [5 Marks]

What is the maximum size of data that the application layer can pass on to the TCP layer below?

- ✓ Any size
- B 2¹⁶ bytes (size of TCP header)
- C 1500
- D None of the above

Explanation
Data of any size can be passed down to the Transport Layer from the application layer, as it can be segmented into multiple chunks based on the MTU of the channel. Hence, option (A) is correct.

Your submitted response was correct.

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Question 26 [5 Marks]

Consider different activities related to email:
1. Send an email from a mail client to a mail server.
2. Download an email from mailbox server to a mail client.
3. Checking emails in a web browser.

Which is the application level protocol used in each activity?

- A 1 - HTTP, 2 - SMTP, 3 - POP
- B 1 - SMTP, 2 - FTP, 3 - HTTP
- ✓ 1 - SMTP, 2 - POP, 3 - HTTP
- D 1 - POP, 2 - SMTP, 3 - IMAP

Explanation
Simple Mail Transfer Protocol (SMTP) is typically used by user clients for sending emails. Post Office Protocol (POP) is used by clients for receiving emails. Checking emails in a web browser is a simple

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Question 27 [5 Marks]

Identify the correct order in which the following actions take place in an interaction between a web browser and a web server.

1. The web browser requests a webpage using HTTP.
2. The web browser establishes a TCP connection with the web server.
3. The web server sends the requested webpage using HTTP.
4. The web browser resolves the domain name using DNS.

✓ 4, 2, 1, 3

B 1, 2, 3, 4

C 4, 1, 2, 3

D 2, 4, 1, 3

Explanation

The web browser first needs to figure out the IP address of the site from the URL using DNS, then

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Question 28 [5 Marks]

Which of the following protocols is used by an email server to maintain a central repository that can be accessed from any machine?

A POP3

✓ IMAP

C SMTP

D DMSP

Explanation

- POP3 is post office protocol Version 3.POP is a protocol which listens on port 110 and is responsible for accessing the mail service on a client machine. POP3 works in two modes such as Delete Mode and Keep Mode.
- IMAP is Internet Message Access Protocol which is used by an email server to maintain a central repository that can be accessed from any machine.

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Question 29 [5 Marks]

Count to infinity is a problem associated with:

A link state routing protocol

✓ distance vector routing protocol

C DNS while resolving the hostname

D TCP for congestion control

Explanation
Networks using distance-vector routing are susceptible to loops and issues with count to infinity. Problems can happen with your routing protocol when a link or a router fails.

Your submitted response was correct.

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Question 30 [5 Marks]

In a fully-connected mesh network with 10 computers, total _____ number of cables are required and _____ number of ports are required for each device.

A 40, 9

B 45, 10

✓ 45, 9

D 50, 10

Explanation
Since each two host need a cable so n(n-1)/2 cabels needed and n - 1 number of ports are required. i.e. 10(10 - 1) / 2 = 5 * 9 = 45 cables. 9 number of ports are required for each device.

Your submitted response was correct.