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# COMPUTER NETWORK

## COMPUTER SCIENCE & IT

Date of Test : 28/08/2024

### ANSWER KEY >

- |        |         |         |         |         |
|--------|---------|---------|---------|---------|
| 1. (a) | 7. (c)  | 13. (d) | 19. (b) | 25. (c) |
| 2. (a) | 8. (c)  | 14. (c) | 20. (c) | 26. (d) |
| 3. (c) | 9. (d)  | 15. (a) | 21. (b) | 27. (a) |
| 4. (c) | 10. (b) | 16. (a) | 22. (d) | 28. (b) |
| 5. (b) | 11. (d) | 17. (b) | 23. (d) | 29. (b) |
| 6. (c) | 12. (c) | 18. (b) | 24. (c) | 30. (a) |

**DETAILED EXPLANATIONS**

1. (a)

$$\begin{array}{r}
 100011 \\
 1101 \overline{) 110110000} \\
 \underline{1101} \phantom{000} \\
 0001 \phantom{000} \\
 \underline{0000} \phantom{000} \\
 0010 \phantom{000} \\
 \underline{0000} \phantom{000} \\
 0100 \phantom{000} \\
 \underline{0000} \phantom{000} \\
 1000 \phantom{000} \\
 \underline{1101} \phantom{000} \\
 1010 \phantom{000} \\
 \underline{1101} \phantom{000} \\
 111 \phantom{000}
 \end{array}$$

Hence, the codeword will be 110110111.

2. (a)

IP of network: 143.128.67.235 / 20

143.128.01000011.11101011

Last IP address assigned to any host:

143.128.01001111.11111110

3<sup>rd</sup> octet: 01001111 = 79

4<sup>th</sup> octet: 11111110 = 254

So,  $x \times y = 79 \times 254 = 20066$

3. (c)

To identify multicast group 1<sup>st</sup> 4 bits are 1110, so total number of multicast address possible are  
 $= 2^{32-4} = 2^{28}$

Probability of choosing same address

$$\begin{aligned}
 &= \frac{1}{\text{Total addresses for multicast}} \\
 &= \frac{1}{2^{28}} = 2^{-28} \\
 &= 3.72 \times 10^{-9}
 \end{aligned}$$

4. (c)

- Retransmission Timer is used to retransmit last segments, when either packet lost or ACK lost.
- Persistent Timer is used to deal with a zero-window size deadlock situation.
- Keep alive time is used to prevent long idle connection between two TCP's.
- TCP Time Wait Timer is used during TCP connection termination.

5. (b)

$$\text{Transmission Time } (T_t) \text{ of packet} = \frac{512 \text{ B}}{1 \text{ Gbps}} = 4096 \times 10^{-9} \text{ sec} = 4.096 \text{ } \mu\text{sec}$$

$$\text{Transmission Time } (T_t) \text{ of ACK} = \frac{64 \text{ B}}{1 \text{ Gbps}} = 512 \times 10^{-9} \text{ sec} = 0.512 \text{ } \mu\text{sec}$$

$$\text{Propagation Time } (P_t) = \frac{1000 \text{ m}}{2 \times 10^8 \text{ m/sec}} = 5 \mu\text{sec}$$

So, for maximum utilization:

$$1 = \frac{\text{T.T. (Packet)} \times N}{\text{T.T. (Packet)} + 2P.T. + \text{T.T. (ACK)}}$$

$$\left[ \frac{\text{T.T. (Packet)} + 2 \times P.T. + \text{T.T. (ACK)}}{\text{T.T. (Packet)}} \right] = N$$

$$\left[ \frac{4.096 + 2 \times 5 + 0.512}{4.096} \right] = N$$

$$\lceil 3.56 \rceil = N$$

$$4 = N$$

6. (c)

All statements are correct.

- Unicast: LSB of the first byte is '0'.
- Multicast: LSB of the first byte is '1'.

7. (c)

We know that for selective repeat

$$\text{ARQ} = 2^{n-1} = 64 = n = 7$$

Sequence numbers: 0 to 127

$$128 + x \text{ (Sequence number)} = 200$$

$$x = 72$$

9. (d)

- Hub is a passive device and switch is an active device. Active device maintains information about ports. Consequently, transmits only to a intended port.
- Hub works on physical layer while switch on DLL.
- Hub is a dumb device. Hence only statement III is correct.

10. (b)

TCP : Transport layer  
 Repeaters : Physical layer  
 Routers : Network layer  
 SMTP : Application layer

11. (d)

$$\text{Total data} = 30 \times 8 \text{ Mb}$$

$$\text{Time for computer to transmit data} = \frac{30 \times 8 \text{ Mb}}{6 \text{ Mb}} \text{ sec} = 40 \text{ sec}$$

Maximum transmission rate = 4 Mbps.

Actual data sent on network in 40 sec

$$= 4 \text{ Mbps} \times 40 = 160 \text{ Mb} = 20 \text{ MB}$$

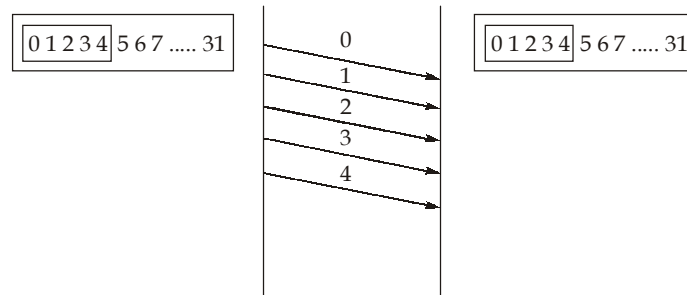
$$\text{Bucket size} = 30 \text{ MB} - 20 \text{ MB} = 10 \text{ MB}$$

12. (c)

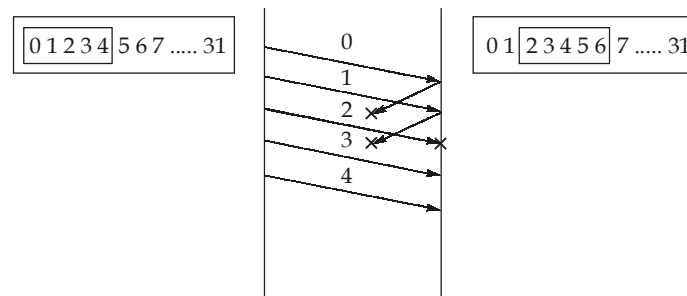
- In redirection packet is not discarded but it is redirected to a n/w as the host doesn't belong to this network.
- In source quench packet is discarded due to congestion in the n/w.
- Destination unreachable means host is not present in the n/w or the host is not responding to the request, then the packet is discarded.

13. (d)

Before sending



After sending and before time out.



Sender window will be 0, 1, 2, 3, 4 and Receiver window will be 2, 3, 4, 5, 6.

14. (c)

Maximum possible efficiency of PURE ALOHA =  $\frac{1}{2} \times e^{-1}$

Maximum possible efficiency of SLOTTED ALOHA =  $1 \times e^{-1}$

Therefore,  $a = \frac{1}{2}, b = -1, c = 1, d = -1$

$$8 \times a \times b \times c \times d = 8 \times \frac{1}{2} \times (-1) \times 1 \times (-1) = 4$$

15. (a)

- Listen ( ): Used on server side, cause a bound TCP socket to enter listening state.
- Bind ( ): Associates a socket with socket address structure.
- Connect ( ): It assigns a free local port number to a socket. In case of TCP socket, it causes an attempt to establish a new TCP connection.
- Accept ( ): Accepts a received incoming attempt to create a new TCP connection from the remote client.

16. (a)

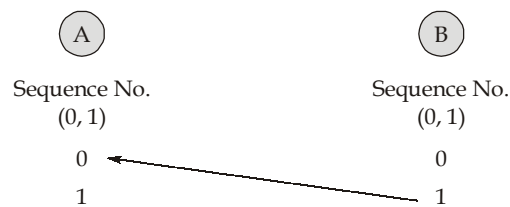
In the slow start algorithm, the size of the congestion window increases exponentially until it reaches a threshold, after this there is additive increases (one-one window) till the time outs. Statement (iii) is false.

17. (b)

- Loss of ACK from client does not effect on termination of connection because client use timeout timer, after it expire it send "ACK" and goes in closed state, where if server does not receive "ACK" then its timer expire and send FIN segment one more time and termination of connection. So True
- Client moves FIN-Wait-1 → FIN-Wait-2 → Timeout → Closed. So False
- Loss of ACK from server does not effect since when client receive FIN from server, then the client understand that "ACK" was lost. So False

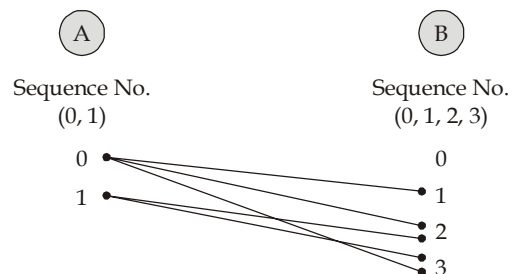
18. (b)

When both station A and B transmit and collide:



Probability of A win 1<sup>st</sup> backoff race =  $\frac{1}{4} = 0.25$

When again A and B transmit and collide



Probability of A win 2<sup>nd</sup> backoff race =  $\frac{5}{8} = 0.625$

19. (b)

- 0.0.0.0/0 is used to identify all networks and is referred to as default route.
- 0.0.0.0/32 is a IP address, which is used by a host when dynamically attempting to learn it's address via DHCP.
- 169.254.X.X/16 range is ensured for automatic private IP addressing. A host assigns itself an address in this range, if it cannot dynamically obtain an address from DHCP server.
- 224.X.X.X-229.X.X.X ranges are reserved for multicast and are referred to as class D addresses.

20. (c)

Maximum Transferable Unit = 500 B

Data bytes that can be transferred in 1 fragment = 500 - 15 = 485

$$\begin{aligned} \text{Number of fragments} &= \left\lceil \frac{3000 - 15}{480} \right\rceil \\ &= \left\lceil \frac{2985}{480} \right\rceil = \lceil 6.218 \rceil = 7 \end{aligned}$$

Since 485 is not divided by 8. So, 480 is sent in one fragment

1<sup>st</sup> fragment = offset = 0, datagram length = 480 + 15 = 495

2<sup>nd</sup> fragment = offset = 60, datagram length = 480 + 15 = 495

3<sup>rd</sup> fragment = offset = 120, datagram length = 480 + 15 = 495

4<sup>th</sup> fragment = offset = 180, datagram length = 480 + 15 = 495

5<sup>th</sup> fragment = offset = 240, datagram length = 480 + 15 = 495

6<sup>th</sup> fragment = offset = 300, datagram length = 480 + 15 = 495

7<sup>th</sup> fragment = offset = 360, datagram length = 105 + 15 = 120

21. (b)

$$B = 30 \text{ mbps} = 30 \times 10^6 \text{ bps}$$

$$\text{Distance } (d) = 3 \text{ km} = 3000 \text{ m}$$

$$\text{Length of frame } (l) = 2000 \text{ bytes}$$

Let the velocity be  $V$  m/s

$$L = 2 \times T_p \times B$$

$$= 2 \times \left( \frac{d}{v} \right) \times B$$

$$2000 \times 8 = 2 \times \frac{3000}{V} \times 30 \times 10^6$$

$$V = 11250 \text{ km/s}$$

22. (d)

All the statements are correct.

23. (d)

That's a discontinuous subnet mask, which is no longer supported on most routers. The principle is the same: convert the dotted-quad IP addresses and mask to 32-bit unsigned integers and AND each address with the mask. If the results are the same, they're in the same subnet.

24. (c)

Number of stations ( $n$ ) = 8

Probability of successful transmission ( $p$ ) = 0.3

Since, we need to find the probability such that only one station transmits in a given slot, hence one station will transmit with 0.3 probability and rest with (1 - 0.3).

$$= np (1 - p)^{n-1} = 8 \times 0.3 (0.7)^7$$

$$= 8 \times (0.3) \times (0.0823543) = 0.198$$

25. (c)

- $S_1$  is true.
- The exponential backoff mechanism reduces the probability of collision on transmission in both ethernet and IEEE 802.11.

26. (d)  
All the statements  $S_1$ ,  $S_2$  and  $S_3$  are correct.

27. (a)

$$\text{Bandwidth} = 8 \text{ kHz}$$

$$\text{Signal to noise ratio} = 30 \text{ dB}$$

$$30 \text{ dB} = 10 \log_{10} \left( \frac{S}{N} \right)$$

$$\left( \frac{S}{N} \right) = 10^3 = 1000$$

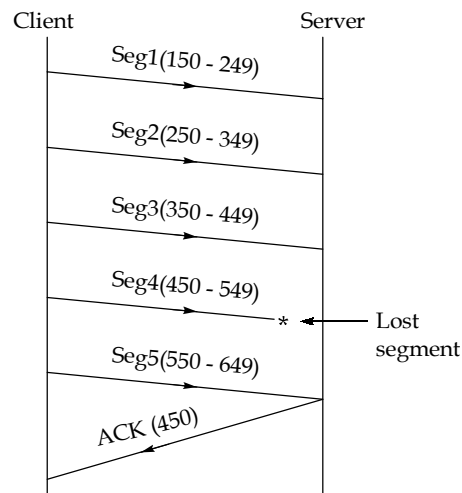
Since channel is errorneous

$$\begin{aligned} \text{So, Maximum data rate} &= B \log_2 \left( 1 + \frac{S}{N} \right) \\ &= 8 \times 10^3 \times \log_2 (1 + 1000) = 79.73 \text{ k bits} \end{aligned}$$

28. (b)

- POP3 and IMAP<sub>4</sub> are well known pull protocols used between receiver's client and mail server.
- In Web Based Protocol, HTTP is work as push and pull protocol.
- SMTP is well known push protocol, it cannot be used between receiver's client and mail server.

29. (b)



So, ACK (450) will be received from the server.

30. (a)

- I. SMTP is used to transfer email from client to server and server to server. So it is correct.
- II. SMTP uses MIME to transfer graphics and file attachments to the server. So it is false.
- III. FTP uses PORT 20 for data transfer and PORT 21 for control signal. So this statement is false.
- IV. MIME extends the capabilities of e-mail in collaboration with other protocols such as SMTP.

