CLASS TEST

S.No. : 01 SK_CS_A+B_280423

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COMPUTER NETWORK

COMPUTER SCIENCE & IT

Date of Test : 28/04/2023

ANSWER KEY

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

DETAILED EXPLANATIONS

1. (b)

Given that collision has occurred, it will be detected by both nodes at

$$t_1 = \frac{\text{Length}}{\text{Speed}} = \frac{800\text{ m}}{2 \times 10^8} = 4\ \mu\text{s}$$

$$\text{Then } X \text{ draws } k = 1$$

$$\text{Wait time} = t_2 = 8 \times k\ \mu\text{s} = 8 \times 1 = 8\ \mu\text{s}$$

$$\text{Transmission time by } X = t_3 = \frac{F}{B} = \frac{1500}{150 \times 10^6} = 10\ \mu\text{s}$$

$$\text{Propagation time } (t_4) = 4\ \mu\text{s}$$

$$\text{Total time} = t_1 + t_2 + t_3 + t_4 = 4 + 8 + 10 + 4 = 26\ \mu\text{s}$$

2. (b)

Considering each statements,

S_1 : IPv6 supports both stateful and stateless auto configuration mode of its host devices. So, the absence of DHCP servers does not create trouble.

S_2 : Through Ethernet/Token ring are considered as broadcast network because they support broadcasting, IPv6 does not have any broadcast support. Although it supports both multicast and anycast services.

S_3 : The solution to the hidden station problem is the use of the handshake frame (RTS and CTS). The CTS frame in CSMA/CA handshake can present collision from a hidden station.

3. (d)

Q	R	S	
∞	∞	∞	Start
1	∞	∞	1 exchange
1	2	∞	2 exchange
1	2	3	3 exchange
1	2	3	4 exchange

Value of 'x' is 4.

Q	R	S	
1	2	3	Start
3	2	3	1 exchange
3	4	3	2 exchange
5	4	5	3 exchange
5	6	5	4 exchange
7	6	7	5 exchange
7	8	7	6 exchange
8	8	8	7 exchange

Value of 'y' is 7.

4. (b)

If a time out occurs there is a stronger possibility of congestion, hence TCP reacts strongly. It sets the value of threshold to one-half of current window size. Set cwnd to size of one segment and starts slow start phase again.

If three ACKs are received, there is a weaker possibility of congestion, a segment may have been dropped. Hence TCP has a weaker reaction. It sets value of threshold to half of current window size. It sets cwnd to the value of threshold. It starts congestion avoidance phase again.

5. (b)

For persistent HTTP: For all files one connection sufficient

1-RTT time for connection establish = 2 message

∴ 1-RTT means two message send, one for connection one for ack.

1-RTT time for request and response for file = 2 message

1-RTT time for 1st file = 2 message

1-RTT time for 2nd file = 2 message

1-RTT time for 3rd file = 2 message

Total message = 2 + 2 + 2 + 2 + 2 = 10

For non-persistent HTTP: In this for every file new connection is established.

1-RTT for connection establishment = 2 message

1-RTT for request and response = 2 message

1-RTT for 1st file = 2 message

Total message for 1st file = 6 message

1-RTT for connection establishment = 2 message

1-RTT for request and response = 2 message

1-RTT for 2nd file = 2 message

Total message for 2nd file = 6 message

1-RTT for connection establishment = 2 message

1-RTT for request and response = 2 message

1-RTT for 3rd file = 2 message

Total message for 3rd file = 6 message

Total message = 6 + 6 + 6 = 18 message

Message saved using persistent HTTP = 18 – 10 = 8 message

6. (b)

Request made by 10 k stations

$$= \frac{10^4 \times 36}{60 \times 60} \text{ request/sec}$$

$$= \frac{10^4 \times 36}{3600} \text{ request/sec} = 100 \text{ request/sec}$$

$$\text{Slot time} = 200\ \mu\text{sec}$$

$$1 \text{ slot} = 200 \times 10^{-6} \text{ sec}$$

$$\frac{1}{200 \times 10^{-6}} \text{slot} = 1 \text{ sec}$$

$$\text{Number of slots} = 5000 \text{ slots/sec}$$

$$G = \text{Channel load} = \frac{\text{No. of request / sec}}{\text{No. of slots / sec}}$$

$$= \frac{100}{5000} = \frac{1}{50} = 0.02$$

$$\text{In percentage} = 0.02 \times 100 = 2\%$$

7. (b)
At attempt 1, both will try and will result in a collision.
At attempt 2, number of slots will be 2 i.e., 0, 1. Similarly for attempt 3, number of slots will be 4 i.e., 0, 1, 2, 3.
So, on attempt 'i', number of slots 2^{i-1}. Probability of collision = $2^{-(i-1)}$ for the failure in 4 rounds.
Failure in 1st round × Failure in 2nd round × Failure in 3rd round × Failure in 4th round × Success in 5th round
$= 2^{-(1-1)} * 2^{-(2-1)} * 2^{-(3-1)} * 2^{-(4-1)} \times [1 - 2^{-(5-1)}]$
$= \{1 * 2^{-1} * 2^{-2} * 2^{-3} \times [1 - 2^{-4}]\}$
$= \{1 * 0.5 * 0.25 * 0.125 * 0.9375\}$
$= 0.0145$

8. (c)
HTTP is stateless protocol. POP3 is application layer protocol and gets it state with the help of TCP. Although TCP is stateful but it is not application layer protocol.

9. (b)
No of available ports = 5223 – 1024 +1 = 4200
Due to time wait of 60 seconds, any repeated connection to same port requires an interval of atleast 60 sec
So average connection that can be opened per second is $= \frac{4200}{60} = 70.$

10. (d)
A multi-cast addressed frame is either flooded out all ports (if no multi-cast optimization is configured) or sent out only the ports interested in receiving the traffic.
The range of multi-cast MAC Address lie between 01-00-5E-00-00-00 to 01-00-5E-7F-FF-FF.
So, option (d) is correct.

11. (a)
We need to satisfy the condition $2r >= m + r + 1$ where r is number of redundant bits and m is number of data bits that needs to be send.
The smallest value for $r = 4$ is satisfying the condition.
Hence the answer is 4.

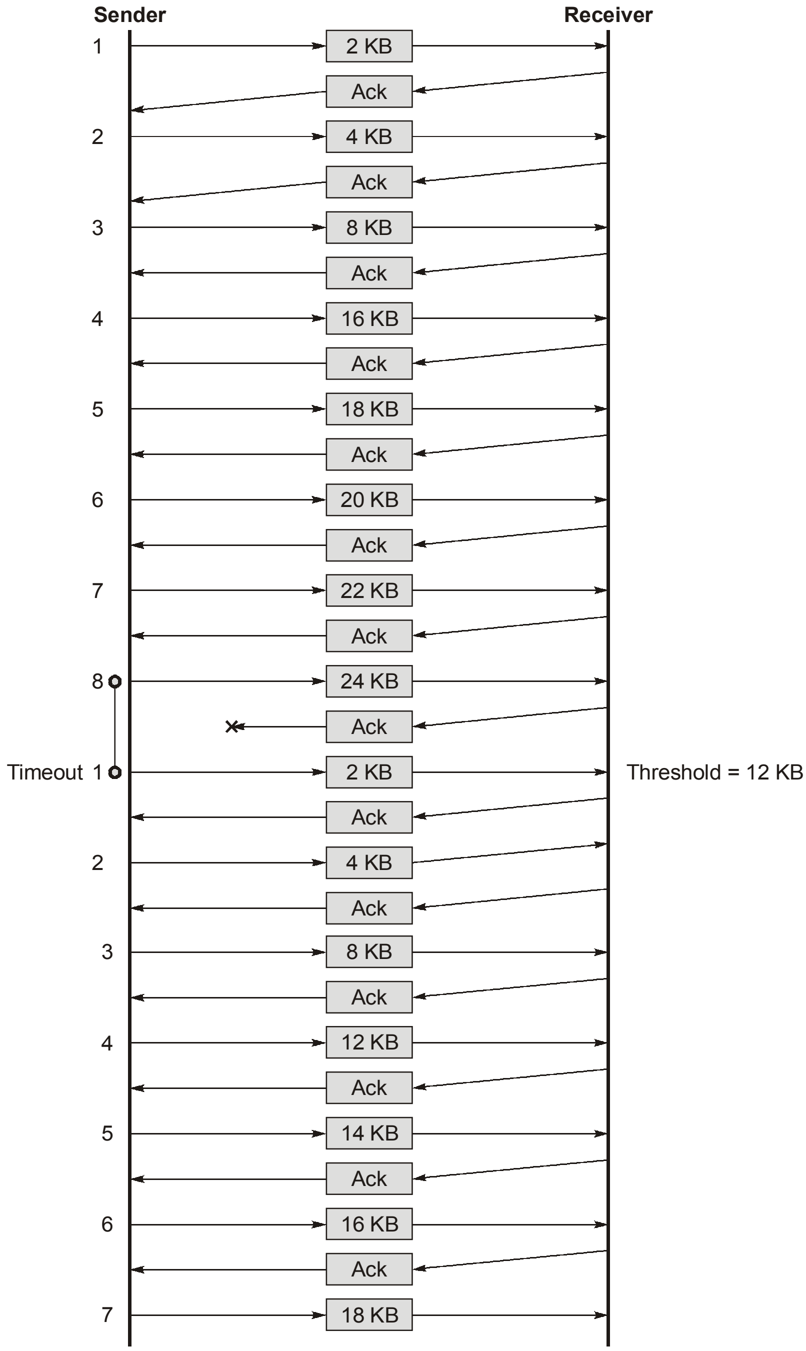
12. (b)
The starting of access to the mail is initiated with the downloading of e-mails from the **mail box**. The starting place of e-mails is the mail box of the client.

13. (a)
Total delay,
= Propagation delay + Transmission Delay + Queuing delay + Processing delay
= 40 ms + 10 ms + 5 ms + 500 KB × (1/10 Gbps + 1/2 Gbps + 1/2 Gbps) = 59.40 ms
Note that here, 'B' is bytes (in data) and 'b' is bits (in speed).

14. (d)
Typically, SNMP uses UDP as its transport protocol. The well known UDP ports for SNMP traffic are 161 (SNMP) and 162 (SNMPTRAP). It can also run over TCP, Ethernet, IPX, and other protocols.
So, only statement (d) is false.

15. (b)

Since, the window size is the minimum of (receiver window, congestion window). Hence, the window size is 36 KB and threshold is 18 KB given.



Hence, the time taken to send first full window of 18 KB is 70 msec.

16. (d)

Since the 4th octet, has all 0's in the net mask, hence any value can be assigned to it.

Coming to the 3rd octet:

Interface-0 $\rightarrow$ **1 0 0 1** 0 0 0 0

Interface-1 $\rightarrow$ **1 1 0 0** 0 0 0 0

R_2 $\rightarrow$ **0 1 1 0** 0 0 0 0

R_3 $\rightarrow$ **0 1 1** 0 0 0 0 0

Calculating 3rd octet for each option of list-1

A. 1 1 0 0 0 1 1 1

B. 0 1 1 0 1 0 0 1

C. 1 1 1 0 0 1 1 0

D. 0 1 1 1 0 1 1 1

Comparing A with interface-1, both have common prefix. B matches its prefix with both R_2 as well as R_3, but the maximum matching with R_2.

Option (c) does not matches with any of the address hence belongs to default.

Option (d) matches with R_3 as both have common prefix.

17. (b)

Number of retransmissions for one frame = $\dfrac{1}{1-p}$.

Number of retransmissions for x frame = $\dfrac{x}{1-p}$

$$\Rightarrow \qquad 500 = \frac{x}{0.4}$$

$$\Rightarrow \qquad x = 500 \times 0.4 = 200$$

18. (c)

- Manchester and differential Manchester encoding has a transition at the middle of each bit.
- Nyquist theorem specifies the minimum sampling rate to the twice the bandwidth of the signal.
- The signal rate is sometimes called as baud rate, whereas the data rate is sometimes called as bit rate.
- In synchronous transmission, we send bits one after another without start or stop. It is the responsibility of the receiver to group the bits.

19. (d)

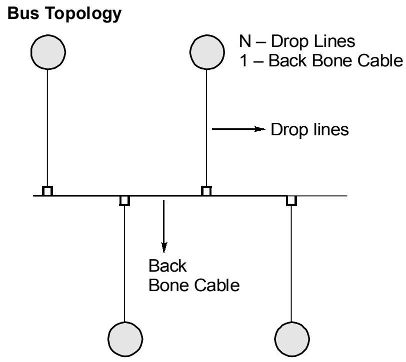
UDP receiver can't be absolutely sure that no bit errors have occurred. Because as per the checksum calculation mechanism, if the corresponding bits of two 16 bit words in the packet were 0 and 1, then even if these get flipped to 1 and 0 respectively, the sum still remains the same. Hence the 1's complement, the receiver calculate is also same.

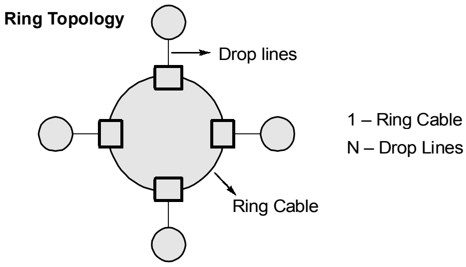
Hence, checksum gets verified, even when there was actually an error during transmission. TCP also uses the same checksum mechanism. Hence the statement will hold true for TCP also.

20. (d)

- Error checking is only for header part.
- There is no acknowledgment for packets reaching the destination.
- IP has minimal error control and there is no concept of error correction for IP datagram.

21. (d)





22. (a)

Fraction of network bandwidth which is filled with headers = 20% = $\frac{1}{5}$

i.e. $$\frac{1}{5} = \frac{10 \times \text{header\_size}}{200\ \text{KB} + 10 \times \text{header\_size}}$$

$$200\ \text{KB} + 10 \times \text{Header-size} = 50 \times \text{Header-size}$$

$$200\ \text{KB} = 40 \times \text{Header-size}$$

$$\text{Header-size} = 5\ \text{KB}$$

23. (a)

$$\text{Node throughput} = 500\ \text{frames/sec}$$

$$\text{System throughput} = 10 * (\text{node throughput})$$

$$= 10 * 500 = 5000\ \text{frames/sec}$$

$$\text{Maximum system rate} = \frac{104 \times 10^6}{2600} = \frac{\text{transmission rate}}{\text{avg frame length}}$$

$$= 40000\ \text{frames/sec}$$

$$\text{Efficiency} = \frac{5000}{40000} = \frac{\text{System throughput}}{\text{Max system rate}} = 0.125$$

$$= 12.5\%$$

24. (c)

Window Size [WS = 1] initially

- After 1 RTT, window size = 2 and 1 segment is sent in total.
- After 2 RTT, window size = 4 and 3 segment is sent in total.
- After 3 RTT, window size = 8 and 7 segment is sent in total.
- After 'X' RTT's, window size = 2^x and 2^{x-1} segment are sent.

Now,
$$2^{x-1} = 3999$$
$$2^x = 4000$$
$$x = \log_2(4000)$$
$$x = 12 \text{ RTT's}$$

25. (b)

First fragment = 0 – 29 = 30
Second fragment = 30 – 59 = 30
Third fragment = 60 – 89 = 30
Last fragment = 90 – 119 = 30
Size of fragment = 30 × 8 = 240 B
Total 5 fragment = 240 × 4 = 960 B
Size of packet = Header + Data = 960 + 20 = 980 B

26. (c)

Total data = 30 × 8 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 Mbps × 40 = 160 Mb = 20 MB
Bucket size = 30 MB – 20 MB = 10 MB

27. (c)

One way delay = 10 msec
One window can be sent = 2 × PT = RTT = 100 msec
One window — 100×10^{-3} sec

$$\frac{10^3}{100} \Leftarrow 1 \text{ sec}$$

⇒ 10 windows/sec
⇒ 10 × 65535 bytes/sec
⇒ 655350 bytes/sec

Maximum data rate = 0.655350 × 8 Mega bits/sec
= 5.2428 Mega bits/sec [∵ 1 byte = 8 bits]

$$\text{Line efficiency} = \frac{5.2428 \text{ Mbps}}{512 \text{ Mbps}} = 0.0102$$

in % = 0.0102 × 100 = 1.02

28. (c)

(*i*) Calculate RTT

$$\text{RTT} = 2 \times 5000 \times 3 \ \mu \text{ sec} = 30 \text{ m sec}$$

(*ii*) In 1 sec —1.25×10^6 bits are covered

$\therefore$ In 36 m sec — $30 \times 10^{-3} \times 1.25 \times 10^6$ bits

$= 37500$ bits are covered

(*iii*) $$\text{Sequence No.} = \frac{37500 \text{ bits}}{8 \times 8 \text{ bits (frame length in bits)}} = 585.9375 \simeq 586$$

(*iv*) $$2^k = 586$$

$\Rightarrow$ $$k = \log_2(586) \simeq 10$$

$\therefore$ Sequence number contains 10 bits.

29. (c)

- 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.
- Close ( ): It terminates the connection.
- Socket ( ): Creates a new socket of certain socket type.
- Poll ( ): Used to check on the state of a socket.
- Accept ( ): Accepts a received incoming attempt to create a new TCP connection from the remote client.

30. (d)

Both I and II are false.

There are 2 subnets

$$\left.\begin{array}{r}111.111.111.110\\111\\112\end{array}\right]\text{Subnet 1}$$

$$\left.\begin{array}{r}222.222.222.220\\21\\22\end{array}\right]\text{Subnet 2}$$

$\therefore$ I is false.

From the beginning to end destination IP does not change. It should be 222.222.222.222 all the way. It implies II is also false.

■■■■