Sl. : 01_SK_CS_BCDF_050325

MADE EASY
India's Best Institute for IES, GATE & PSUs

Delhi | Bhopal | Hyderabad | Jaipur | Pune | Kolkata

Web: www.madeeasy.in | **E-mail:** info@madeeasy.in | **Ph:** 011-45124612

COMPUTER NETWORK

COMPUTER SCIENCE & IT

Date of Test : 05/03/2025

ANSWER KEY ➤

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

DETAILED EXPLANATIONS

1. (d)

In CSMA/CD to detect a collision condition will be T.T. ≥ 2 T.P. i.e. frame size should be greater than maximum propagation time between two stations.

2. (c)

Broadcast address = 173.140.31.255

173 is class B

31.255 = 00011111.11111111

(A) 240.0 ⇒ 11110000.00000000 ⇒ 12 bits are host

(B) 248.0 ⇒ 11111000.00000000 ⇒ 11 bits are host

(C) 192.0 ⇒ 11000000.00000000 ⇒ 14 bits are host

14 bits of host remains all 14 bits should be 1's in broadcast address, this condition is violating.

So 255.255.128.0 cannot suit for given address.

3. (b)

$$T_t \geq 2T_p$$

$$\frac{\text{Frame length}}{\text{Bandwidth}} \geq 2\times\frac{\text{Distance}}{\text{Speed}}$$

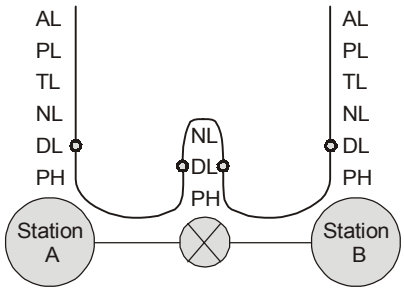
$$\Rightarrow \quad \frac{18000}{600\times10^6} \geq \frac{2x}{2{,}50{,}000\ \text{km}}$$

$$\Rightarrow \quad \frac{18\times10^3\times25\times10^4}{600\times10^6}\text{km} \geq 2x$$

$$x = 3.75\ \text{km}$$

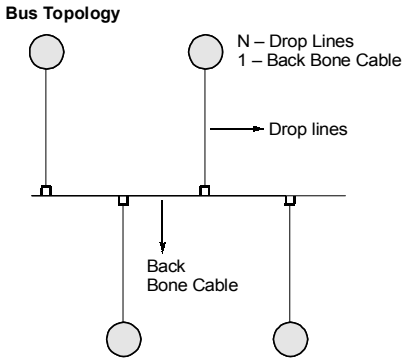
$$x = 3750\ \text{m}$$

4. (c)



So, data link layer is visited 4 times.

5. (d)



6. (c)

For slotted aloha throughput

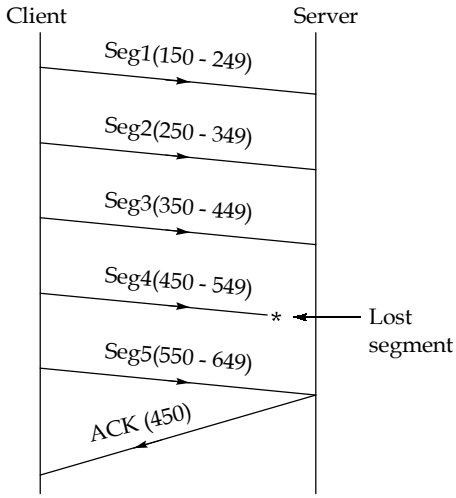
$$S = Ge^{-G}$$

$$= 3 \times e^{-3} = \frac{3}{20.085}$$

$$= 0.1493 \times 100 = 14.93\%$$

$$= \frac{14.93 \times 2 \times 10^3 \text{ Kbps}}{100} = 298.6$$

7. (d)



TCP an accept out of order segments but always sends in order ack.

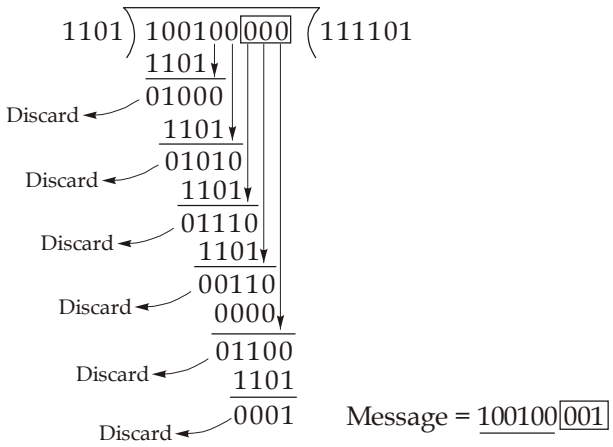
8. (d)

All the statements are correct.

9. (a)

- CRC polynomial is the divisor and the message is dividend. The remainder is added to the message and then it is send.

- CRC is always 1 bit < divisor. 1st bit is always discarded.



Append the remainder to the message. It is called as CRC message.

10. (c)

Router and Switch reduce collision domain.

11. (c)

- Network layer provides best efforts delivery services which does not include any kinds of acknowledgment.
- If LSP is with less recent data than the data stored in database is received, then new LSP is updated with database data and is sent back only over the link from which the first LSP was received.

12. (c)

Chance of a frame of getting through undamaged

$$= 0.6$$

Chance of whole message getting through is

$$P = (0.6)^8 = 0.01679616$$

Mean number of transmissions

$$= \frac{1}{P} = \frac{1}{0.01679616}$$

$$= 59.54$$

13. (a)

The IP address 200.25.80.67 belongs to class C network. Therefore network ID is 200.25.80.0 and DBA is 200.25.80.255.

The binary representation contains:

11001000.00011001.01010000.00000000

$\Rightarrow$ 24 0's in network ID

11001000.00011001.01010000.11111111

$\Rightarrow$ 16 0's in network IP

$\therefore$ $24 \log_2 16 = 24 \times 4 = 96$

14. (b)

For station-1 (at network layer) : Total packet size is 1400 bytes. (1380 B data + 20 B header = 1400 B)

At network-2 : MTU = Data + Header

or, Data = MTU – Header

= 620 – 20 = 600 bytes

$$\text{Number of fragments} = \frac{1380}{600} = 2.3$$

1st fragment data = 596 B + 20 B (616 B)

2nd fragment data = 596 B + 20 B (616 B)

3rd fragment data = 188 B + 20 B (208 B)

Total size received = 616 + 616 + 208 = 1440 Bytes

15. (b)

$$t = \frac{C}{M-\rho}$$

Where C : Capacity of token bucket

ρ : Token generation rate

M : Maximum data rate of token bucket

t = time for which token bucket can send the data with maximum data rate.

So,
$$t = \frac{2\times10^6 \text{ bytes}}{16\times10^6 \text{ bytes/sec.} - 8\times10^6 \text{ bytes/sec}}$$

$$t = \frac{2}{8} = 0.25 \text{ sec}$$

16. (b)

To	Next Hop	Distance	
P	–	0	
Q	Q	3	[P → Q = 3]
R	Q	4	[P → Q → R = 3 + 1 = 4]
S	S	2	[P → S = 2]
T	S	6	[P → S → T = 2 + 4 = 6]
U	S	4	[P → S → U = 2 + 2 = 4]

17. (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.

18. (a)

Subnet mask is 255.255.255.224

(i) $62 \Rightarrow \underset{\longleftrightarrow}{001}\ \underset{\longleftrightarrow}{11110} \Rightarrow$ Last host

(ii) $94 \Rightarrow \underset{\longleftrightarrow}{010}\ \underset{\longleftrightarrow}{11110} \Rightarrow$ Last host

(iii) $127 \Rightarrow \underset{\longleftrightarrow}{011}\ \underset{\longleftrightarrow}{11111} \Rightarrow$ Direct broadcast address

(iv) $191 \Rightarrow \underset{\longleftrightarrow}{101}\ \underset{\longleftrightarrow}{11111} \Rightarrow$ Direct broadcast address

19. (d)

CSMA CD (Carrier Sense Multiple Access with Collision Detection) method is used in ethernet.

20. (d)

$$t = \frac{C}{M-\rho}$$

Where
C : Capacity of token bucket
ρ : Token generation rate
M : Maximum data rate of token bucket
t = Time for which token bucket can send the data with maximum data rate.

So,
$$t = \frac{4\times10^6 \text{ bytes}}{16\times10^6 \text{ bytes/sec.} - 8\times10^6 \text{ bytes/sec}}$$

$$t = \frac{4}{8} = 0.50 \text{ sec}$$

21. (b)

$$Tx = 105 \times 8 \text{ bits}/40 \text{ Kbps} = 21 \text{ ms}$$
$$Tp = 504 \text{ ms}$$
$$a = \frac{Tp}{Tx} = \frac{504}{21} = 24$$

$$\text{Efficiency of GBN} = \frac{W}{(1+2a)}$$

where, W = Window size

$$= \frac{15}{(1+48)} = \frac{15}{49}$$

BW utilization or throughput or maximum data rate = Efficiency × BW

$$= \frac{15}{49} \times 40 \text{ kbps} = 12.24 \text{ Kbps}$$

22. (d)

1024 Subnets
16 bits + 10 bits + 6 bits
Network + subnet + host
First of host address of subnet 1024
11111111 11 000001 = 255.193
Last of host address of subnet 1024
11111111 11 111110 = 255.254
172.89.255.193/26 → 172.89.255.254/26

23. (d)

Frame header are the headers attached at DLL. Since fragmentation is at network layer. Hence
MTU for A-R_1 → 1010 B
MTU for $R_1 - R_2$ → 504 B
MTU for R_2-B → 500 B
Total IP packet size → 940 B [920 B + 20 B]

Link A-R_1:

Length = 940, DF = 0, MF = 0, Offset = 0 [920 B + 20 B]

Link $R_1 - R_2$:

1. Length = 500, DF = 0, MF = 1, Offset = 0 [480 B + 20 B]
2. Length = 460, DF = 0, MF = 0, Offset = 60 [440 B + 20 B]

Link R_2-B:

1. Length = 500, DF = 0, MF = 1, Offset = 0 [480 B + 20 B]
2. Length = 460, DF = 0, MF = 0, Offset = 60 [440 B + 20 B]

24. (c)

$$\text{Link utilization} \le 50\%$$

$$\frac{N}{1+2a} \le \frac{1}{2}$$

$$a = \frac{T_p}{T_t}$$

$$T_p \text{ (propagation delay)} = \frac{d}{V} = \frac{10000 \times 10^3}{4 \times 10^6} = 2.5 \text{ sec}$$

$$T_t \text{ (Transmission delay)} = 20 \text{ msec}$$

$$a = \frac{2.5}{20 \times 10^{-3}} = 125$$

$$\frac{N}{1+2\times125} \le \frac{1}{2}$$

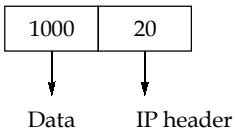
(Window size) $N \le 125.5$

In selective repeat protocol, the window must be less than half the sequence number space.

$$\frac{2^m}{2} \leq 125$$
$$2^{m-1} \leq 125$$
$$2^{m-1} = 2^7$$
$$\Rightarrow \quad m = 8$$

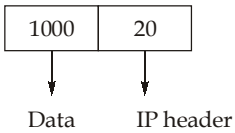
25. (d)

Frame header are the headers attached at DLL. Since fragmentation is at network layer. Hence
MTU for A-R_1 $\rightarrow$ 1485 B
MTU for $R_1 - R_2$ $\rightarrow$ 690 B
MTU for R_2-B $\rightarrow$ 588 B
Total IP packet size $\rightarrow$ 1020 B [1000 B + 20 B]



Link (A - R_1)

Packet 1



Link (R_1 - R_2)

Packet 1	664	20
Packet 2	336	20

Link (R_1 - B)

Packet 1aa	568	20
Packet 1ab	96	20
Packet 1b	336	20

Hence, last packet is 1b so,

Total length = 356
DF = 0
MF = 0
Offset = 83

26. (d)

In IPv4 Header,
The maximum possible value of time to live (TTL) in IPv4 is 255.
The maximum value of fragment offset is 65,528.
In IPv4 frame format there are 40 bytes of option field, out of which only 38 bytes can be used, 2 bytes are reserved . Also one IPv4 address is of 4 bytes.

Thus maximum IPv4 address that can be hold = $\frac{38}{4} = 9$. So, none statements are correct.

Option (d) is true.

27. (b)

Subnet address is the ANDing between IP address and subnet Mask.

$$\begin{array}{r} 201{\cdot}14{\cdot}78{\cdot}01000001 \\ \underline{255{\cdot}255{\cdot}255{\cdot}11100000} \\ 201{\cdot}14{\cdot}78{\cdot}01000000 \end{array}$$

or 201· 14· 78· 64

28. (a)

The probability of sending a frame in the first slot without any collision by any of these four stations is sum of following 4 probabilities that are = Probability that S1 sends a frame and no one else does + Probability that S2 sends a frame and no one else does + Probability that S3 sends a frame and no one else does + Probability that S4 sends a frame and no one else does

$= 0.1 * (1 - 0.2) * (1 - 0.3) * (1 - 0.4) + (1 - 0.1) * 0.2 * (1 - 0.3) * (1 - 0.4) + (1 - 0.1) * (1 - 0.2) * 0.3 * (1 - 0.4) + (1 - 0.1) * (1 - 0.2) * (1 - 0.3) * 0.4 = 0.4404$

29. (b)

255.255.255.192 — 192 = 1100 0000

Subnets $2^2 - 2 = 2$ ⊗

255.255.255.248 — 248 = 1111 1000

Subnets $2^5 - 2 = 30$

Number of hosts = $2^3 - 2 = 6$ ⊗

255.255.255.240 — 240 = 1111 0000

Subnets $2^4 - 2 = 14$

Number of hosts = $2^4 - 2 = 14$ ☑

255.255.255.224 — 224 = 1110 0000

Subnets $2^3 - 2 = 6$

Number of hosts = $2^5 - 2 = 30$ ☑

So, answer will be 2.

30. (d)

Considering each statements,

- SMTP is text-based protocol and MIME extension helps in sending graphics and multimedia. POP3 and IMAP4 are used for retrieving information from server, they do not help SMTP to send multimedia.

■■■■