CLASS TEST

Sl. : 01SK_ABCDEFGHIJ_12824

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 : 12/08/2024

ANSWER KEY

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

DETAILED EXPLANATIONS

1. (b)

- Since lost frames are transmitted again and again so to remember which packet reached successfully, sequence number is used.
- RTS frame tells the amount of time data + ACK is transmitted in one go.
- IEEE 802.11 uses CSMS/CA instead of CSMA/CD.
- The exponential backoff mechanism reduces the probability of collision on retransmissions in both ethernet and in IEEE 802.11.

2. (c)

- Hub is the broadcasting device i.e. transmitted data in all direction which can leads to collision.
- Bridge is the collision domain separator i.e. reduced collision domain.
- Switch is the collision domain separator as well as broadcast domain separate.

3. (d)

Total data = 30 × 8 Mb

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

4. (c)

IP of block: 128.44.82.16 /25
Subnet mask: 255.255.255.128
Perform 'AND' operation between IP of block and subnet mask to get subnet id.

128.44.82.16
255.255.255.128

128.44.82.0

First assigned address to host: 128.44.82.1
Last assigned address to host: 128.44.82.126
128.44.82.0 is subnet id and 128.44.82.127 is direct broadcast address, so cannot assigned to any host.

5. (a)

To identity multicast group 1st 4 bits are 1110, so total number of multicast address possible are
$= 2^{32-4} = 2^{28}$
Probability of choosing same address

$$= \frac{1}{\text{Total adresses for multicast}}$$

$$= \frac{1}{2^{28}} = 2^{-28}$$

$$= 3.72 \times 10^{-9}$$

6. **(b)**

- IPv6 does not have broadcasting concept and fragmentation is done by sender only but in IPv4 fragmentation can be done at intermediate router.
- IPv4 uses checksum as error detecting technique while IPv6 uses CRC extension header as error detecting technique.

7. **(b)**

- POP3 and $IMAP_4$ 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.

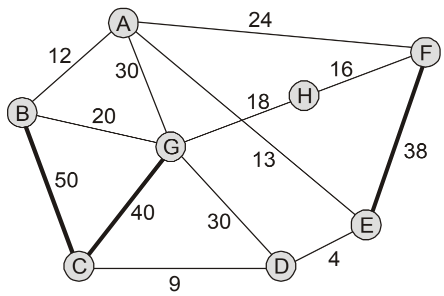
8. **(c)**

- 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.

9. **(a)**

- When an IP router between two ethernet segments forwards an IP packet, it does not modify the destination IP address but can change the MAC address. Infact, source and destination IPs are never changed.
- IPv4 uses time to live field to prevent looping when due to some errors in routing table packet start looping in network.

10. **(c)**



After stabilizing all the routing table linked BC (50), CG (40), EF (38) are not used since to reach B to C path CDEAB is present which has cost 38, to reach C to G path CDG is present which has cost 39 and to reach E to F path EAF is present which has cost 37. So 3 links are not used.

11. (a)

We know that, $n = p \times q$

Where p and q are prime number.

So, by hit and trial method (by checking only prime number)

$$3599 = 59 \times 61$$

So, p and q can be any one from 59 or 61.

$$\phi(n) = (59 - 1) \times (61 - 1) = 58 \times 60 = 3480$$

We know that,

$$ed = 1 \bmod \phi(n)$$

$$31 \times d = 1 \bmod 3480$$

We can write it as and solve for 'x':

$$31x + 3480y = 1$$

$$3480 = 112 \times 31 + 8$$

$$31 = 3 \times 8 + 7$$

$$8 = 1 \times 7 + 1$$

Write last one as:

$$8 - 1 \times 7 = 1$$

$$8 - 1 \times (31 - 3 \times 8) = 1$$

$$(3480 - 112 \times 31) - 1 \times (31 - 3 \times (3480 - 112 \times 31)) = 1$$

Make above equation in terms of 31 and 3480

$$3480 - 112 \times 31 - 1 \times 31 + 3 \times 3480 - 336 \times 31 = 1$$

$$4 \times 3480 - 449 \times 31 = 1$$

$$(-449) \times 31 + 4 \times 3480 = 1$$

We conclude $d = -449$; is infect 3031 mod 3480.

So, $d = 3031$

12. (b)

$$\text{Bandwidth} = 150 \text{ Mbps}$$

$$\text{Frame size} = 5000 \text{ bytes}$$

$$\text{Propagation delay} = 6 \times 10^4 \ \mu\text{sec}$$

$$= 60 \times 10^{-3} \text{ sec} = 60 \text{ msec}$$

$$\text{So in 1RTT} = 60 \times 2 \times 10^{-3} \times 150 \times 10^6 \text{ bits}$$

$$= 18000 \times 10^3 \text{ bits}$$

But maximum bits that can be transferred in one time = 100 frame

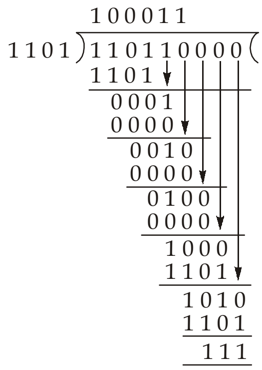
$$= 5000 \times 8 \times 100 \text{ bits} = 4000000 \text{ bits}$$

$$\text{So, effective bandwidth} = \frac{4000000}{18 \times 10^6} \times 150 \text{ Mbps}$$

$$= \frac{4}{18} \times 150 \times 10^6 \text{ bps} = \frac{600}{18} \times 10^6 \text{ bps}$$

$$= 33.33 \text{ Mbps}$$

13. (a)



Hence, the codeword will be 110110111.

14. (a)

IP of network: 143.128.67.235 / 20

143.128.0100 0011.11101011

Last IP address assigned to any host:

143.128.01001111.11111110

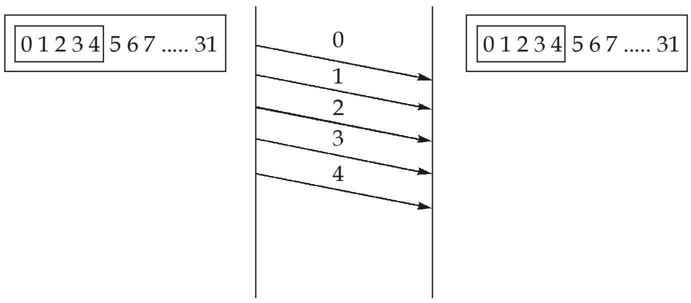
3rd octet: 01001111 = 79

4th octet: 111111110 = 254

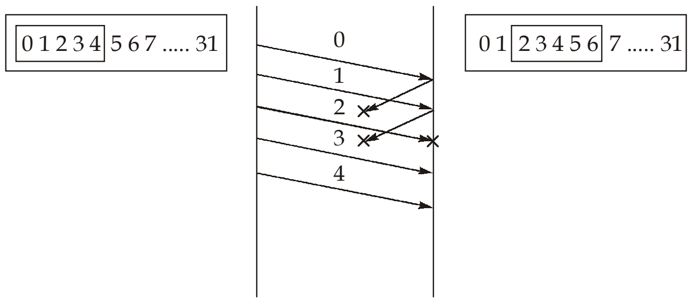
So, $x \times y = 79 \times 254 = 20066$

15. (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.

16. (b)

$$\text{ERTT} = \alpha\ \text{IRTT} + (1 - \alpha)\ \text{NRTT}$$

ERTT is estimated RTT, IRTT is initial RTT and NRTT is new RTT

$$\text{ERTT} = 0.8 \times 28 + 0.2 \times 29 = 28.2$$

When 2^{nd} ACK come

$$\text{ERTT} = 28.2 \times 0.8 + 0.2 + 33 = 29.16$$

When 3^{rd} ACK come

$$\text{ERTT} = 29.16 \times 0.8 + 0.2 + 22 = 27.72$$

17. (b)

IPv6 support multicasting, unicasting, anycasting but it does not support broadcasting.

18. (b)

IP address 201.24.58.69 belongs to class C network

$$\text{Network ID} = 201.24.58.0$$
$$= 11001001.00011000.00111010.00000000$$
$$\text{Number of 1's} = 10 = a$$

$$\text{Directed broadcast address DBA} = 201.24.58.255$$
$$= 11001001.00011000.00111010.11111111$$
$$\text{Number of 1's} = 18 = b$$
$$a + b = 18 + 10 = 28$$

19. (a)

HTTP can use multiple TCP connection between same client and server.

(ii) and (iii) is correct statements.

20. (c)

S_1 : Persistent timer is used to prevent deadlock, when receiver sends an acknowledgement with a window size 0, after that when window size updated receiver sends the capacity to sender but if ack is lost, then both will be waiting.

S_2 is correct statement.

21. (b)

TCP has error control machanism, it does not depends on ICMP for error reporting message.

Packet switching is based on store and forward technique.

Functionality of network layer is source to destination delivery of packets.

22. (c)

In synchronous transmission the synchronous bits are neglected by receiver hence not considered as part of data.

23. (c)

$$n = p \times q$$
$$= 13 \times 17 = 221$$
$$\phi(n) = (p - 1) \times (q - 1)$$
$$= 12 \times 16 = 192$$
$$(d \times e) \bmod \phi(n) = 1$$
$$(d \times 35) \bmod 192 = 1$$
$$d = 11$$

Alternate solution:

$$d \times e = 1\% \ \phi(n)$$
$$d \times e = 1 + k \cdot \phi(n)$$
$$d = \frac{1 + k \cdot \phi(n)}{e}$$
where $k = 0, 1, 2$ .....

24. **(b)**

$$\text{Transmission Time} = 2 \times \text{P.T.}$$
$$\frac{\text{Data size}}{\text{Bandwidth}} = 2 \times \left(\frac{L}{V}\right)$$
$$\frac{x}{10^7 \text{ bits/sec}} = 50 \ \mu\text{sec}$$
$$x = 500 \text{ bits}$$

25. **(d)**

S_1 : Ethernet frame include CRC not checksum.
S_2 : ARP request is broadcast and reply is unicast.
S_3 : Differential Manchester encoding has a transition at the middle of each bit.
S_2 and S_3 both are true.

26. **(a)**

System is collision free if only one station is sending data at a time

$$P = {}^8C_1 \times (p)^r \times (q)^{h-r}$$
$$= {}^8C_1 \times (0.3)^1 \times (0.7)^7$$
$$= 8 \times 0.3 \times 0.0823 = 0.198$$

27. **(a)**

$$\text{Transmission Time } (T_t) \text{ of packet} = \frac{512 \text{ B}}{1 \text{ Gbps}} = 4096 \times 10^{-9} \text{ sec} = 4.096 \ \mu\text{sec}$$
$$\text{Transmission Time } (T_t) \text{ of ACK} = \frac{64 \text{ B}}{1 \text{ Gbps}} = 512 \times 10^{-9} \text{ sec} = 0.512 \ \mu\text{sec}$$
$$\text{Propagation Time } (P_t) = \frac{1000 \text{ m}}{2 \times 108 \text{ msec}} = 5 \ \mu\text{sec}$$

So, for maximum utilization:

$$1 = \frac{\text{T.T. (Packet)} \times N}{\text{T.T.(Packet)} + 2\text{P.T.} + \text{T.T. (ACK)}}$$
$$\left\lceil \frac{\text{T.T. (Packet)} + 2 \times \text{PT} + \text{TT (ACK)}}{\text{T.T. (Packet)}} \right\rceil = N$$
$$\left\lceil \frac{4.096 + 2 \times 5 + 0.512}{4.096} \right\rceil = N$$
$$\lceil 3.56 \rceil = N$$
$$4 = N$$

28. **(c)**

Maximum Transferable Unit = 500 B

Data bytes that can be transfered in 1 fragment = 500 – 15 = 485

$$\text{Number of fragments} = \left\lceil \frac{3000-15}{480} \right\rceil$$

$$= \left\lceil \frac{2985}{480} \right\rceil = \lceil 6.218 \rceil = 7$$

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

1st fragment = offset = 0, datagram length = 480 + 15 = 495

2nd fragment = offset = 60, datagram length = 480 + 15 = 495

3rd fragment = offset = 120, datagram length = 480 + 15 = 495

4th fragment = offset = 180, datagram length = 480 + 15 = 495

5th fragment = offset = 240, datagram length = 480 + 15 = 495

6th fragment = offset = 300, datagram length = 480 + 15 = 495

7th fragment = offset = 360, datagram length = 105 + 15 = 120

29. **(b)**

Using Non-Persistent Connection:

$$\text{Time } (T_1) = [2\,\text{RTT}] \times \text{Number of time connection established} + \text{Transmission Time}$$

$$= \underset{\uparrow\,\text{Images}}{2} \times \underset{\uparrow\,\text{Connection established}}{(3+1)} \times \underbrace{2 \times 75\text{ ms}}_{\text{RTT}} + \frac{(500\text{ KB} \times 3 + 250\text{ KB})}{100\text{ Mbps}}$$

$$= 2 \times (600)\text{ ms} + \frac{(12\text{ Mb} + 2\text{ Mb})}{100\text{ Mbps}}$$

$$= 1200\text{ msec} + 140\text{ msec}$$

$$= 1340\text{ msec}$$

Using Persistent Connection:

$$\text{Time } (T_2) = [3\text{ RTT} + \text{Transmission Time}]$$

$$= \underset{\uparrow\,\text{3 Images}}{3} \times \underbrace{(2 \times 75)}_{\text{RTT}}\text{ msec} + \frac{(4\text{ Mb} + 2\text{ Mb})}{100\text{ Mbps}}$$

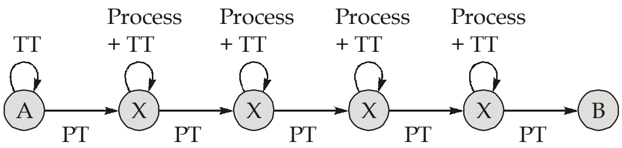
$$= 450\text{ msec} + 140\text{ msec}$$

$$= 590\text{ msec}$$

$$\text{Time } (T) = T_1 - T_2$$

$$= 1340 - 590 = 750\text{ msec}$$

30. (b)



$$\text{Transmission Time} = \frac{1500 \text{ Bits}}{100 \text{ Mbps}} = 15\ \mu\text{sec}$$

$$\text{Propagation Time} = \frac{1200 \text{ m}}{2 \times 10^8 \text{ m/sec}} = 6\ \mu\text{sec}$$

$$\text{Processing Time} = \frac{20 \text{ Bits}}{100 \text{ Mbps}} = 0.2\ \mu\text{sec}$$

Cable is divided in 5 parts, so propagation delay between entry two points is

$$= \frac{6\ \mu\text{sec}}{5} = 1.2\ \mu\text{sec}$$

So, time taken at 1st switch = $15 + 1.2 + 0.2 = 16.4\ \mu\text{sec}$

Time at switches = $16.4 \times 4 = 65.6\ \mu\text{sec}$

Total Time = Time at switch + Time at node A

= $65.6\ \mu\text{sec} + 15 + 1.2$

= $81.8\ \mu\text{sec}$

■■■■