COMPUTER NETWORKS TEST 1

Number of Questions: 35 **Section Marks: 30**

Directions for questions 1 to 35: Select the correct alternative from the given choices.

1. Among the following network topologies, which has the highest reliability?
(A) Mesh topology (B) Bus topology
(C) Star topology (D) Ring topology

2. Which one of the following uses UDP as transport protocol?
(A) SMTP (B) HTTP
(C) POP (D) DNS

3. The transport layer protocol that is used to support electronic mail is?
(A) IP (B) UDP
(C) TCP (D) SMTP

4. Find the number of characters per sec (7 bits + 1 priority) that can be transmitted over 4800 bps line using synchronous transfer. (1 start & 1 stop bit)?
(A) 480 (B) 500
(C) 600 (D) 520

5. Find the number of cross points needed for 15 lines in a cross point switch which is full duplex in nature and there are no self connection?
(A) 225 (B) 105
(C) 30 (D) 60

6. What is the maximum data rate of a channel for a noiseless 6 KHz binary channel?
(A) 12000 bps (B) 12 bps
(C) 3000 bps (D) 800 bps

7. Which of the following statements are true about flooding?
I. It is a type of isolated routing
II. Selective flooding is a type in which the packets are sent to those lines that are going approximately in the right direction
III. It is a method in which every incoming packet is sent out on every outgoing line except the one on which it has arrived.
IV. Flooding does not always select the shortest path
(A) I and III (B) II and III
(C) I, II, III and IV (D) I, II and III

8. Which one of the following is not a standard RS232C signal?
(A) RTS (B) VDR
(C) DSR (D) CTS

9. What happens to the size of congestion window in the slow start phase of TCP congestion algorithm?
(A) Increases linearly
(B) Does not change
(C) Increase exponentially
(D) Increase quadratically

10. A company has a class *B* network and they wanted to subdivide the network to all the 32 departments. The subnet mask would be
(A) 255. 255. 0. 0 (B) 255. 255. 248. 0
(C) 255. 255. 32. 0 (D) 255. 255. 252. 0

11. Which one of the following is true about a layer–4 firewall (can look at all protocol headers upto the transport layer)?
(A) Cannot block all ICMP traffic
(B) Cannot block entire HTTP traffic during 9.00 pm and 5.00 am
(C) Cannot block TCP traffic from a specific user on a multi user system during 9.00 pm and 5.00 am
(D) Cannot stop incoming traffic from a specific IP address but allow outgoing traffic to the same IP address

12. What is the maximum window size for data transmission using the selective Repeat protocol with 8 bit frame sequence number?
(A) 128 (B) 64
(C) 256 (D) 255

13. Which one of the following is not a network layer protocol?
(A) ICMP (B) DHCP
(C) RARP (D) SDLC

14. Find the number of connections in a mesh network with 10 nodes?
(A) 45 (B) 100
(C) 101 (D) 55

15. Find the number of networks allowed under class *B* address of an IPV_4 network?
(A) 2^{22} (B) 2^{24}
(C) 2^{14} (D) 2^{16}

16. Station *A* sends data to station *B* over a full duplex link. Both *A* and *B* are using the sliding window protocol for flow control. The window size of sender and receiver is 6 packets each. Data packets (sent only from *A* to *B*) are all 700 bytes long and the transmission time for such a packet is 60 μs. Acknowledgement packets that are sent only from *B* to *A* are very small and require negligible transmission time. The propagation delay over the link is 120 μs. What is the maximum achievable throughput in this communication?
(A) 20×10^6 bps (B) 70×10^6 bps
(C) 50×10^6 bps (D) 60×10^6 bps

17. Which of the following shows the Hamming distance of following strings Respectively.
I. 1101101 and 1101100
II. 1110111 and 1111011
III. 1111011 and 0011001
(A) 2, 1, 3 (B) 1, 2, 3
(C) 3, 2, 1 (D) 1, 1, 2

18. Find the minimum frame size for a 20 Mbps Ethernet having 56 bit jamming signal and round trip propagation delay of 64 μs:
(A) 2560 (B) 640
(C) 1336 (D) 320

19. Find the maximum number of hosts per subnet on a class *B* network with a subnet mask of 255.255.252.0:
(A) 1024 (B) 2046
(C) 2048 (D) 1022

20. Match the following:

I.	Telnet	1.	Session layer
II.	DHCP	2.	Application layer
III.	RPC	3.	Data link layer
IV.	HDLC	4.	Network layer
		5.	Presentation layer

(A) I–2, II–1, III–5, IV–4
(B) I–2, II–4, III–1, IV–5
(C) I–2, II–1, III–5, IV–3
(D) I–2, II–4, III–1, IV–3

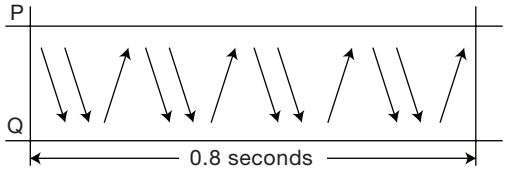
21. Consider the RSA public key cryptosystem with the private and public keys as (e, n) and (d, n) respectively, where $n = p * q$ and p and q are large primes. Besides 'n' is public, p and q are private. Let m be an integer such that $0 < m < n$ and $z = (p - 1)(q - 1)$, Then which of the following equations correctly represent RSA cryptosystem?
I. $m^1 = m^e \bmod z$
$m = (m^1)^d \bmod z$
II. $ed = 1 \bmod z$
III. $m^1 = m^e \bmod n$
$m = (m^1)^d \bmod n$
IV. $ed = 1 \bmod n$
(A) II and III (B) III and IV
(C) I and II (D) I and IV

22. Which of the following conditions must be satisfied by a polynomial generator used for CRC to detect odd number of errors?
I. It should be divisible by x
II. It should not be divisible by x
III. It should be divisible by $1 + x$
IV. It should not be divisible by $1 + x$
(A) I and IV (B) II and III
(C) II and IV (D) I and III

23. Consider an IPV_4 diagram, the M bit is 0, the value of header length is 20, the value of total length is 500 and the fragment offset value is 400. The sequence number of first and last bytes of payload along with the position of the datagram are respectively.
(A) 3200, 3619, First fragment
(B) 3200, 3619, Last fragment
(C) 3200, 3819, Last fragment
(D) 1800, 3819, Middle fragment

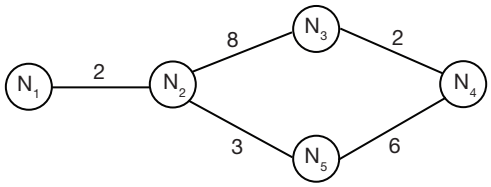
24. A 64 kbps pure ALOHA channel is to be shared among a number of stations, each sending 1k bit frames, on an average one frame every 10 seconds. Assume that sender can buffer frames to handle unsuccessful sendings.
What is the maximum number of stations this network can support? (A pure ALOHA channel has a maximum capacity of 18.4%).
(A) 111 (B) 117
(C) 122 (D) 124

25. The exchange of Ethernet frames between two computers P and Q is shown in the figure below. The connection uses 10 BaseT hub and each frame sent by computer P contains 1500 B of Ethernet payload data, while each frame sent by computer Q contains 100 B of Ethernet payload data. Find the average utilization of the media during this exchange?



(A) 5.68% (B) 10.24 %
(C) 1.27 % (D) 15.67 %

Linked Data Questions 26 and 27:
Consider a network with five nodes as shown in the figure.



The above network uses distance vector routing protocol. The distance vector is the distance of the best known path at that instance to nodes. The distance of a node to itself is zero. All the links are symmetric & the cost is same in both directions. Initially the distance vector at different nodes is
N_1 : (0, 2, 10, 11, 5)
N_2 : (2, 0, 8, 9, 3)
N_3 : (10, 8, 0, 2, 8)
N_4 : (11, 9, 2, 0, 6)
N_5 : (5, 3, 8, 6, 0)
In each round, all nodes exchange their distance vectors with their respective neighbours. Then all the nodes update their distance vectors. In between 2 rounds, any change in cost of a link will cause the two incident nodes to change only that entry in their distance vectors.

26. The cost of link $N_2 - N_3$ is reduced by 4 (in both directions). After the next round of updates what will be the new distance vector at node N_3?
(A) (6, 4, 0, 2, 7)
(B) (10, 4, 0, 2, 8)
(C) (10, 4, 0, 2, 7)
(D) (6, 4, 0, 2, 8)

27. After the update in the above question the link $N_1 - N_2$ goes down. N_2 will reflect this change immediately in its distance vector at cos t α. After the next round of update, what will be the cost to N_1 in the distance vector of N_3?
(A) 13 (B) ∞
(C) 11 (D) 6

28. The CIDR based IP address for an ISP is given as 252.246.128.0/21. The ISP wants to give half of this address to organization X and a quarter to organization Y, while retaining the remaining with itself. Which of the following is a valid allocation of addresses to X and Y?
(A) 252.246.128.0/20 and 252.246.128.0/21
(B) 252.246.136.0/20 and 252.246.128.0/21
(C) 252.246.128.0/22 and 252.246.136.0/23
(*D* 252.246.128.0/21 and 252.246.136.0/22

29. In Ethernet CSMA/CD, the special bit sequence transmitted by media access management for collision handling is called:
(A) jam (B) Preamble
(C) Postamble (D) None of the above

30. Which one of the following network routing method uses every possible path between the sender and receiver terminal?
(A) Directory routing (B) Random routing
(C) Message switching (D) Packet flooding

31. Which one of the following statements are correct?
(A) Baseband network uses analog technology
(B) Baseband network is Time Division Multiplexed
(C) In Broadband network, the carrier signals operate at low frequency
(D) Broadband network uses digital technology

32. How many number of bytes are there for a header in TCP segment and UDP segment respectively?
(A) 16 bytes and 8 bytes (B) 8 bytes and 16 bytes
(C) 8 bytes and 20 bytes (D) 20 bytes and 8 bytes

33. Which of the following statements about DES is/are true?
(i) DES is asymmetric key encryption
(ii) DES is symmetric key encryption
(iii) DES uses different keys in each of the 16 iterations
(A) Only I (B) Only II
(C) I and III (D) II and III

Common Data Questions 34 and 35:
Consider the routing table below.

Destination	Gateway	Mask	Flags	Interfaces
175.220.105.128	175.220.105.164	225.255.255.136	U	eth0
192.128.1.0	192.128.1.1	255.255.255.0	U	eth1
127.0.0.1	127.0.0.1	255.0.0.0	U	Loop back 0
Default	175.220.105.129	255.255.255.255	UG	eth0

34. How many local subnets is this machine attached to?
(A) 1 (B) 2
(C) 3 (D) 4

35. How many IP addresses can this machine reach to (excluding the loop back router)?
(A) 128 (B) 512
(C) 384 (D) 256

Answer Keys

1. A	**2.** D	**3.** C	**4.** C	**5.** B	**6.** A	**7.** D	**8.** B	**9.** C	**10.** B
11. C	**12.** A	**13.** D	**14.** A	**15.** C	**16.** B	**17.** B	**18.** C	**19.** D	**20.** D
21. A	**22.** B	**23.** B	**24.** B	**25.** C	**26.** A	**27.** A	**28.** C	**29.** A	**30.** D
31. B	**32.** D	**33.** D	**34.** B	**35.** C					

Hints and Explanations

4. $\frac{4800}{8}$. Here start & stop bits are not considered as transfer is synchronous Choice (C)

5. $\frac{n(n-1)}{2} = \frac{15 \times 14}{2} = 105$ Choice (B)

6. $2H \log_2 v$ H → Band width
V → Discrete level
Here $H = 6$ – KHz and $V = 2$
$2 \times 6000 \log_2 2$ Choice (A)

12. $2^{(n-1)} = 2^{(8-1)} = 2^7$ Choice (A)

14. Number of connections $= \frac{n(n-1)}{2}$
n → no. of nodes Choice (A)

16. Maximum achievable throughput

$$= \frac{\text{Total size}}{\text{Total time}} = \frac{6 \times 700 \times 8}{(6 \times 60 + 120) \times 10^{-6}}$$

Total packet size = packet size × window size

Total time = Transmission time + propagation time

Choice (B)

17. I. 1101101
1101100
0000001

Hamming distance is 1

II. 1110111
1111011
0001100

Hamming distance is 2

III. 1111011
0011001
1100010

Hamming distance is 3 Choice (B)

18. Minimum frame size

= 2 × propagation delay × Band width

$= 64 \times 10^{-6} \times 20 \times 10^{6} = 1280$

[Round trip time = 2 × propagation delay]

⇒ 1280 + 56 = 1336 Choice (C)

19. 255.255.252.0 ↔ 11111111.11111111.

11111100.00000000
(10 bits)

No. of hosts per subnet = $2^{10} - 2 = 1024 - 2 = 1022$

Choice (D)

23. $M = 0$, means no more fragmentation i.e. the last fragment

Header Length = 20 × 4 = 80 bytes

Payload = 500 – 80 = 420 (0 – 419)

Fragment offset = 400 × 8 = 3200 bytes

Seq. No. of I[st] fragment = 3200

Seq. No. of last fragment = 3200 + 419 = 3619

Choice (B)

24. Average data rate per station is 1,000 bits/10 sec or 100 bps.

A pure ALOHA channel has a maximum capacity of 18.4%

A 64 kbps channel would send

= 64,000 × 0.184

= 11, 776 bps

We can move 11,776 bps through this channel when managed by pure ALOHA and at its maximum throughput.

$\therefore \frac{11776}{100} = 117$ stations can be supported with 64 kbps pure ALOHA channel. Choice (B)

25. Number of frames from P to $Q = 8$

Ethernet MAC frame payload = 1500 = 1500 + 26

= 1526 bytes = 12208 bits

Number of frames from $Q = 4$

Frame payload = 100 B

100 + 26 = 126 bytes

126 × 8 = 1008 bits

Total utilized bandwidth = 12208 × 8 + 1008 × 4

= 101696 (achieved capacity) but actual capacity is 10 Mbps (10 Base T)

$$\text{Utilization} = \frac{101696}{8 \times 10 \times 10^{6}} = 1.27\%$$ Choice (C)

26. N_3: (6, 4, 0, 2, 7) Choice (A)

28. Total bit mask = 21

To allocate half of host to X need

10 bit i.e. 2^{10} host

$\therefore$ Mask for $X = 22$ bits

To allocate $\frac{1}{4}$ of host to Y need 9 bit i.e. 2^9 host

Mask for Y (32 – 9) = 23 bits Choice (C)

35. 2^7 (in first n/w) + 2^8 (in second n/w)

Choice (C)