

COMPUTER NETWORKS
(CSBS 3101)

Time Allotted : 3 hrs

Full Marks : 70

Figures out of the right margin indicate full marks.

Candidates are required to answer Group A and any 5 (five) from Group B to E, taking at least one from each group.

Candidates are required to give answer in their own words as far as practicable.

Group – A
(Multiple Choice Type Questions)

1. Choose the correct alternative for the following: **10 × 1 = 10**
- (i) Given an IP address is 180.25.21.172 and subnet mask is 225.225.192.0. What is the subnet address?
(a) 180.25.21.0 (b) 180.25.0.0 (c) 180.25.8.0 (d) 180.0.0.0.
- (ii) What is the maximum length of CAT-5 UTP cable in Fast Ethernet network?
(a) 200 meters (b) 100 meters (c) 1000 meters (d) 500 meters.
- (iii) Which one of the following uses UDP as transport protocol?
(a) DNS (b) HTTP (c) SMTP (d) Telnet.
- (iv) ICMP resides at the same layer as which of the following protocol mentioned below?
(a) TCP (b) UDP (c) IP (d) PPP.
- (v) Which detection method can detect a single bit error?
(a) CRC (b) Single parity check
(c) Two dimensional parity check (d) All of these.
- (vi) _____ is a collision free technique.
(a) Token Passing (b) ALOHA (c) CSMA/CD (d) CSMA
- (vii) Choose the correct option
(a) ARP is MAC-to-IP mapping, RARP is IP-to-MAC mapping
(b) ARP is MAC-to-IP mapping, RARP is MAC-to-MAC mapping
(c) ARP is IP-to-MAC mapping, RARP is MAC-to-IP mapping
(d) ARP is MAC-to-IP mapping, RARP is MAC-to-IP mapping.
- (viii) Choose the most appropriate
(a) BGP is Distance Vector, OSPF is Link State
(b) BGP is Distance Vector, OSPF is Distance Vector
(c) BGP is Link State, OSPF is Link State
(d) BGP is Link State, OSPF is Distance Vector.

- (ix) In the slow start phase of the TCP congestion control algorithm, the size of the congestion window
- (a) does not increase (b) increases linearly
(c) increases quadratically (d) increases exponentially.
- (x) A small organization is given a block with the beginning address and the prefix length 205.16.37.24/29 (in slash notation). What is the range of the block?
- (a) 8 (b) 16 (c) 24 (d) 32.

Group- B

2. (a) For each of the following networks, discuss the consequences if a connection fails:
- (i) Five devices arranged in a bus topology
(ii) Five devices arranged in a ring topology. [(CO1)(Analyse/IOCQ)]
- (b) Compare and contrast a circuit switched network and a packet switched network. [(CO2)(Understand/LOCQ)]
- (c) Discuss the functions of Session layer in OSI reference model. [(CO1)(Remember/LOCQ)]
- (3 + 3) + 3 + 3 = 12**
3. (a) Let the information sequence is 101110110101010 and the divisor polynomial is $x^3 + x^2 + 1$. Find the sent codeword corresponding to the information sequence. Suppose that the codeword has a transmission error in the 4th bit from LSB. What does the receiver obtain when it does its error checking? [(CO3)(Apply/IOCQ)]
- (b) Differentiate between router and switch. [(CO1)(Understand /LOCQ)]
- (4 + 4) + 4 = 12**

Group - C

4. (a) Explain with suitable diagrams why the receiver window size in selective repeat ARQ protocol should be equal to $2^{(m-1)}$. [(CO3)(Analyze/LOCQ)]
- (b) Explain the working of CSMA/CD protocol with a suitable flowchart. [(CO3)(Understand/LOCQ)]
- (c) Explain the concept of bit stuffing with suitable examples. [(CO3)(Understand/LOCQ)]
- 3 + 6 + 3 = 12**
5. (a) Show that “The efficiency of slotted ALOHA protocol is twice compared to the pure ALOHA protocol”. [(CO3)(Analyze/IOCQ)]
- (b) Consider a 50-kbps satellite channel with a 500-msec round-trip propagation delay. Frame size is 1000 bit. Find the following:
- (i) If stop and wait protocol is used in the above channel, calculate for what percentage of time the sender will be idle.
- (ii) If sliding window protocol is used, what should be the ideal window size of the sender? [(CO3)(Analyze/IOCQ)]
- 6 + (3 × 2) = 12**

Group - D

6. (a) Draw the header format of IP packet and explain the importance of the following fields: identification, flags, fragmentation offset and TTL fields. [[CO4](Understand/LOCQ)]
- (b) In an IPv4 datagram, the M/F bit is 0, the value of HLEN is 10, the value of total length is 400 and the fragment offset value is 300. Determine the position of the datagram, the sequence numbers of the first and the last bytes of the payload. [[CO4](Apply/IOCQ)]
(4 + 4) + 4 = 12
7. (a) Draw the ARP packet header and clearly mention the importance of each field. [[CO4](Understand/LOCQ)]
- (b) An organization needs total 12 subnets divided into following blocks:
2 subnets each with 128 addresses
2 subnets each with 64 addresses
2 subnets each with 32 addresses
3 subnets each with 16 addresses
3 subnets each with 4 addresses
An ISP provides an address 152.56.72.0/22, to them. Design the subnets. Find out how many addresses are still available after this allocation. [[CO4](Apply/IOCQ)]
4 + 8 = 12

Group - E

8. (a) TCP opens a connection using an initial sequence number (ISN) 14,454. The other party opens the connection with an ISN of 21,732. Show the three TCP segments during the connection establishment. [[CO5](Apply/IOCQ)]
- (b) A leaky bucket is used to control liquid flow. How many gallons of liquid are left in the bucket if the output rate is 5gal / min? Assume that there is an input burst of 100 gal/min for 12 sec, and there is no input for 48 sec. [[CO5](Apply/IOCQ)]
- (c) What do you mean by Jitter in communication? [[CO5](Understand/LOCQ)]
6 + 4 + 2 = 12
9. (a) Consider an instance of TCP's Additive Increase Multiplicative Decrease (AIMD) algorithm where the window size at the start of the slow start phase is 2 MSS and the threshold at the start of the first transmission is 8 MSS. Assume that a time out occurs during every fifth transmission. Find the congestion window size at the end of the 14th transmission (draw a suitable graph to explain your answer). [[CO5](Analyze/IOCQ)]
- (b) Write short note on: (i) DHCP (ii) FTP. [[CO6](Remember/LOCQ)]
6 + (3 + 3) = 12

Cognition Level	LOCQ	IOCQ	HOCQ
Percentage distribution	43.75	56.25	0

Course Outcome (CO):

After the completion of the course students will be able to:

- CO 1. Describe the fundamental concepts of data communication and networking, layered models, protocols, networking devices.
- CO 2. Describe theoretical basis for data communication, digital and analog transmission, multiplexing, switching, transmission media.
- CO 3. Illustrate data link layer services, framing, error control, flow control, data link layer protocols and various channel access protocols.
- CO 4. Examine various routing algorithms, addressing schemes and different network layer protocols.
- CO 5. Analyze different transport layer protocols, techniques for congestion control and QoS provisioning.
- CO 6. Define different application layer protocols.

*LOCQ: Lower Order Cognitive Question; IOCQ: Intermediate Order Cognitive Question; HOCQ: Higher Order Cognitive Question