

# **COMPUTER COMMUNICATION NETWORKS**

## **(MCA1202)**

**Time Allotted : 2½ hrs**

**Full Marks : 60**

***Figures out of the right margin indicate full marks.***

***Candidates are required to answer Group A and any 4 (four) from Group B to E, taking one from each group.***

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

## Group - A

1. Answer any twelve:

$$12 \times 1 = 12$$

*Choose the correct alternative for the following*

(viii) Which protocol is used for IP address resolution to MAC addresses?  
(a) DHCP            (b) ARP            (c) RARP            (d) ICMP

(ix) Which of the following is an example of a distance-vector routing protocol?  
(a) OSPF            (b) RIP            (c) BGP            (d) MPLS

(x) In link-state routing, each router shares information about:  
(a) Only its directly connected neighbours  
(b) The entire network topology  
(c) The shortest path to all destinations  
(d) Only the fastest links in the network

*Fill in the blanks with the correct word*

- (xi) The \_\_\_\_\_ topology is the most fault-tolerant network topology.
- (xii) The maximum theoretical data rate of a noiseless channel is determined by \_\_\_\_\_ theorem.
- (xiii) The \_\_\_\_\_ layer of the OSI model is responsible for encryption and compression of data.
- (xiv) Sliding Window flow control improves efficiency by allowing multiple frames to be sent \_\_\_\_\_ waiting for an acknowledgment.
- (xv) A higher signal-to-noise ratio (SNR) results in \_\_\_\_\_ data transmission quality.

## Group - B

2. (a) Define the five components of a data communication system with examples. *[(CO1)(Understand/LOCQ)]*

(b) A company plans to set up a fully connected mesh topology network for 10 devices to ensure high reliability.

- Calculate the total number of cables required and the number of ports needed per device. *[(CO1)(Apply/IOCQ)]*
- Analyze the advantages and disadvantages of implementing a full mesh topology in a large-scale enterprise network. *[(CO1)(Analyse/IOCQ)]*

**4 + (4 + 4) = 12**

3. (a) Explain the concept of line coding and describe its key characteristics. Provide examples of different line coding schemes such as NRZ, RZ, Manchester, and Differential Manchester. *[(CO2) (Understand/IOCQ)]*

(b) A digital signal needs to be encoded using NRZ-L and Manchester encoding. Given the bit sequence: 11001010, draw the waveforms for both encoding schemes and compare their bandwidth requirements. *[(CO2) (Apply/IOCQ)]*

**8 + 4 = 12**

## Group - C

4. (a) Explain the process of character stuffing in the context of framing in the Data Link Layer. How does it help in ensuring synchronization of data? [(C03)(Understand/LOC01)]

(b) A 7-bit data word needs to be transmitted using Hamming Code. Find the number of redundant bits required. [(CO3) (Apply/IOCQ)]

$$(5 + 3) + 4 = 12$$

5. (a) Discuss the types of errors that can occur in data transmission, focusing on single-bit errors. Explain how error detection and correction techniques help in mitigating these errors. [(CO3) (Analyse/IOCQ)]

(b) A sender wants to transmit three 8-bit binary numbers 10110110, 11001101, and 11100011 using Checksum error detection. Find the checksum value at the sender's side. [(CO3) (Apply/IOCQ)]

$$(4 + 4) + 4 = 12$$

### Group - D

6. (a) Describe the Distance Vector Routing algorithm used in the Network Layer. Discuss its operation, including how routers exchange routing information and make forwarding decisions. [(CO5) (Understand/LOCQ)]

(b) Demonstrate the need for sub netting. [(CO4) (Understand /LOCQ)]

$$(3 + 6) + 3 = 12$$

7. (a) Examine the role of Network Address Translation (NAT) in IPv4. [(CO4) (Understand/LOCQ)]

(b) Given the IP address 192.168.10.25/27, determine the following: [(CO4) (Apply/IOCQ)]

- i. Network Address
- ii. Broadcast Address
- iii. Usable Host Range

$$6 + 6 = 12$$

### Group - E

8. (a) Examine the Three Way Handshake protocol to establish the transport level connection. [(CO5) (Analyse/IOCQ)]

(b) Analyze the various duties of Transport Layer. [(CO5) (Remember/LOCQ)]

$$7 + 5 = 12$$

9. (a) Describe the Leaky Bucket algorithm used to improve Quality of Service in network traffic management. Discuss how it regulates the rate of data transmission and helps in controlling traffic bursts. [(CO5) (Analyse/IOCQ)]

(b) Interpret on unicast, multicast and broadcast routing. [(CO4) (Remember/LOCQ)]

$$(6 + 3) + 3 = 12$$

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Cognition Level	LOCQ	IOCQ	HOCQ
Percentage distribution	39.58	60.42	0

