

**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 × 1 = 12**

*Choose the correct alternative for the following*

- (i) Which type of network topology requires a central controller or hub?  
(a) Bus                      (b) Ring                      (c) Star                      (d) Mesh
- (ii) Which layer of the OSI model is responsible for error detection and correction?  
(a) Transport                      (b) Data Link  
(c) Network                      (d) Physical
- (iii) Which OSI layer is responsible for flow control and segmentation?  
(a) Transport                      (b) Network  
(c) Data Link                      (d) Physical
- (iv) Why does fiber-optic cable have a higher bandwidth than copper cable?  
(a) It transmits signals using electrical pulses  
(b) It uses higher frequencies of light waves  
(c) It is immune to electromagnetic interference  
(d) It requires less power to transmit
- (v) How does the CRC (Cyclic Redundancy Check) detect errors in data transmission?  
(a) By adding redundant bits using XOR division  
(b) By checking bit synchronization  
(c) By verifying signal strength  
(d) By analysing amplitude variations
- (vi) Why is ALOHA less efficient than CSMA/CD?  
(a) It does not detect collisions before transmission  
(b) It requires more bandwidth  
(c) It relies on fixed time slots  
(d) It is only suitable for wired networks
- (vii) What is the primary purpose of the network layer in the OSI model?  
(a) Addressing and routing                      (b) Error detection  
(c) Flow control                      (d) Encryption

- (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.
    - I. Calculate the total number of cables required and the number of ports needed per device. [[CO1](Apply/IOCQ)]
    - II. 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? [[CO3](Understand/LOCQ)]

- (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:  
 i. Network Address  
 ii. Broadcast Address  
 iii. Usable Host Range [[CO4](Apply/IOCQ)]  
**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**

---

Cognition Level	LOCQ	IOCQ	HOCQ
Percentage distribution	39.58	60.42	0

