



## Mahindra University, Hyderabad

École Centrale School of Engineering

End-semester Regular Examination

Program: B. Tech.

Branch: CSE, ECE, CM and ICSE Year: II/III Semester: II

Subject: COMPUTER NETWORKS(CS 2202)

Date: 28-05-2025

Time Duration: 3 Hours

Start Time: 10:00AM

Max. Marks: 100

### Instructions:

- 1) All questions carry same marks
- 2) All the sub-questions of a question must be answered at one contiguous place

### Question-1

[4 x 5 = 20]

- a) Neatly draw the waveforms resulting from NRZ, NRZ-I, Manchester and AMI signaling for transmitting the bit stream "1010100111".
- b) Compare the channel capacities of the following two systems using Shannon's theorem:
  - System A: Bandwidth = 1 MHz, Signal-to-Noise Ratio (SNR) = 31 dB
  - System B: Bandwidth = 500 kHz, SNR = 37 dB. Which system offers a higher channel capacity, and why?
- c) What is the significance of the OSI model in networking? List two key responsibilities of each layer of the OSI model.
- d) Explain the different components of end-to-end delay (latency) in a network. Then, compute the total delay experienced by a 2000-byte packet transmitted over a 100 Mbps link, given a propagation delay of 10 milliseconds and a processing delay of 2 milliseconds. Assume that queuing delay is negligible.
- e) Give the significance of an amplifier, a bridge, a router and a gateway in a network.

### Question-2

[4\*5=20]

- a) Explain the working of parity, checksum and CRC error checking schemes.
- b) Describe the working process of CSMA/CD with the help of a flowchart.
- c) Consider a long-distance terrestrial communication link between two systems located 40,000 km apart. The link has a bandwidth of 400 Mbps, and the propagation speed is  $3 \times 10^8$  m/s (speed of light). A Go-Back-N ARQ protocol is used to ensure reliable transmission. The average packet size is  $10^2$  bits, and processing and queuing delays are negligible. What is the minimum number of bits required for the sequence number field to fully utilize the link capacity (i.e., achieve 100% utilization)?
- d) A 1.5 km long broadcast LAN has a bandwidth of 50 Mbps and uses CSMA/CD. The signal travels at  $2 \times 10^8$  m/s. What is the minimum packet size for this network?
- e) Write the instances for retransmission in flow control.

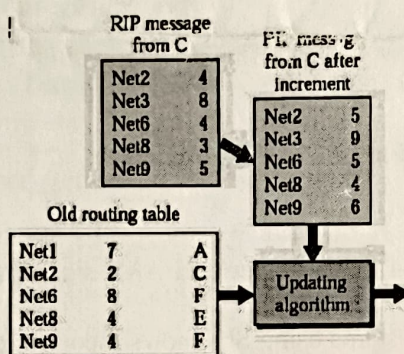


### Question-3

[ 20]

Answer the following questions briefly (within 30 words). Draw neat diagrams where applicable

- (a) How is broadcast routing different from multi-cast routing? (3)  
(b) Give the algorithm for RIP. Update the following routing table of router C using RIP with reasons to update each network interface. (4)



- (c) An ISP has been allocated a block of CIDR-based IP addresses: 245.248.32.0/19. The ISP intends to divide this block equally among four organizations: A, B, C, and D. Determine a valid allocation of IP address blocks to each organization, ensuring equal distribution and proper CIDR notation. (3)  
(d) What do you mean by classful addressing. Why CIDR is required? (3)  
(e) What is the basic routing mechanism of BGP? (1 mark) Compare the working of this mechanism with link state routing and Bellman-Ford routing mechanisms (4 marks). (5)  
(f) Compare and contrast LSR and DVR. (2)

### Question-4

[4 x 5 = 20]

- (a) Describe the opening of a TCP connection (giving the state transition diagram) and indicate the role played by various TCP header fields in this process.  
(b) Explain how SSL and TLS assures the security for Transport Layer.  
(c) Give the header format of UDP. Give an example to calculate checksum in UDP header.  
(d) Explain the working of the slow start mechanism for congestion control-is it really slow (illustrate with a diagram)?  
(e) How different TCP variants handles congestion?

### Question-5

[ 20]

- (a) What are the standard ports for HTTP, FTP, SMTP, POP3? (2)  
(b) What is the purpose of DNS? Explain the DNS working process using a suitable diagram. (4)  
(c) Construct a simple SMTP session to illustrate the working of the SMTP commands. (3)  
(d) Construct a simple POP3 session to illustrate the working of the POP3 commands; what's the main difference between POP3 and IMAP? (3)  
(e) What are the important steps in writing a socket program for a TCP client using the Berkley Socket API? (4)  
(f) Explain the structure and functionality of the HTTP and DHCP. (4)