REG.NO.:

SLOT: C2

VIT

Vellore Institute of Technology
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SCHOOL OF COMPUTER SCIENCE AND ENGINEERING
CONTINUOUS ASSESSMENT TEST - II
WINTER SEMESTER 2025-2026

Programme Name & Branch	: B.Tech.Computer Science and Engineering and Business Systems
Course Code and Course Name	: CBS3001, Computer Networks
Faculty Name(s)	: Dr. Arivoli A, Dr. Sudhakar K
Class Number(s)	: VL2025260502270, VL2025260502088
Date of Examination	: 17/3/2026
Exam Duration	: 90 minutes

Maximum Marks: 50

General instruction(s):

- Answer All Questions
- M - Max mark; CO – Course Outcome; BL – Blooms Taxonomy Level (1 – Remember, 2 – Understand, 3 – Apply, 4 – Analyzed, 5 – Evaluate, 6 – Create)
- Course Outcomes: (Type the CO statements covered in this question paper. Use the CO number as per the syllabus copy)
  CO3: Implement various error detection and correction mechanisms, flow control mechanisms and various routing
  CO4: Design subletting and analyse the performance of network layer, Construct and examine various routing protocols

Q. No	Question	Module	Mark	CO	BL
1.	A computer network uses the Selective Repeat ARQ protocol for reliable data transmission. The sequence number field is 3 bits, so frame numbers range from 0 to 7. The sender window size is 4. During transmission, the following events occur: • The sender transmits frames 0, 1, 2, and 3. Frames 0 and 1 are acknowledged. • Frame 2 is lost, but frame 3 arrives successfully and is stored at the receiver. • The sender transmits frames 4 and 5 after receiving acknowledgements for frames 0 and 1. • Frame 4 is received and acknowledged, while frame 5 is corrupted. • The timer for frame 2 expires, and the sender retransmits frame 2. • After receiving frame 2, the receiver delivers frames 2 and 3 in order. • Later, frame 5 is retransmitted and acknowledged. a) Draw the sender and receiver windows for each stage of the above transmission. (4 marks) b) Explain how the receiver handles the out-of-order frame (Mention the frame number) in this situation. (2 marks) c) Identify the frames that were retransmitted and explain why retransmission occurred. (2 marks) d) If Go-Back-N ARQ were used instead of Selective Repeat, which frames would be retransmitted after frame 2 was lost? (2 marks)	3	10	3	3

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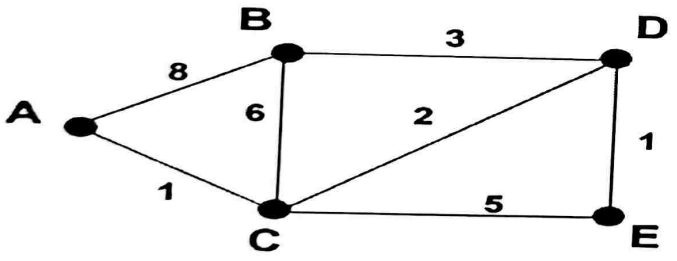
2.	A Pure ALOHA and Slotted ALOHA network transmits 300-bit frames on a shared channel with a data rate of 250 kbps. Determine the throughput of the system if the total number of frames generated by all stations together is: a) 900 frames per second b) 450 frames per second c) 220 frames per second a. Compare the results and discuss which protocol provides the maximum throughput. (3) b. Define vulnerable time and determine the vulnerable period for both Pure ALOHA and Slotted ALOHA. Explain how vulnerable time affects collision probability in these protocols. (2)	3	10	3	3
3.	a) Consider an IP packet with a length 5500 bytes that includes a 20-byte IPv4 header. The packet is forwarded to an IPV4 router that supports a Maximum Transmission unit MTU of 800 bytes. Assume that the length of the header in all the outgoing fragments of this packet is 20 bytes. Assume that the fragmentation offset value store in the first fragment is 0. What is the fragmentation offset stored in the third fragment?	4	10	4	3
	b) A company has been allocated the IPv4 network address 194.182.15.0 for its internal network. The network administrator plans to divide the network into 16 subnets to support different departments and improve network management. a) Determine the subnet mask required to create 16 subnets. (2 marks) b) Design the 16 subnets and list their subnet addresses. (6 marks) c) Find the number of usable hosts per subnet (2 marks)				
4.	Six equal-size datagrams belonging to the same multimedia message are transmitted from a source to a destination in a packet-switched network. Due to network congestion and dynamic routing, each datagram travels through different paths and passes through different switches. The network contains five switches, each introducing a processing delay. The details are given below. Propagation speed = 2×10^8 m/s	4	10	4	3

Datagram	Path Length	Visited Switches
1	9,500 km	1,3,4
2	12,000 km	1,2,5
3	8,200 km	1,4
4	10,500 km	1,2,3,5
5	11,200 km	1,3,5
6	9,800 km	1,2,4,5

	Processing delay at each switch: • Switch 1 = 1 ms • Switch 2 = 2 ms • Switch 3 = 1.5 ms • Switch 4 = 2.5 ms • Switch 5 = 1 ms Find the order of the datagram arrives at the destination.				
5.	A smart city management team is deploying a network of sensors to monitor traffic conditions across several important road intersections. Each intersection is modelled as a node in the network, while the connections between them represent communication links used for transmitting traffic data. The numerical value assigned to each link represents the cost of sending data between two intersections. This cost may depend on factors such as network delay, bandwidth consumption, or energy usage. The central monitoring station, located at Node A, needs to gather traffic information from all other intersections while ensuring the minimum possible transmission cost. To achieve efficient routing of data, the engineers decide to use Dijkstra's Least-Cost Algorithm to determine the optimal communication paths from the control center to all other nodes in the network. Consider a packet-switched network with Node A as the source. Using Dijkstra's shortest path (least-cost) algorithm, compute the least-cost paths from Node A to all other nodes. (6)  a. Why is Dijkstra's Algorithm more appropriate for this traffic monitoring network compared to the Bellman–Ford algorithm? (2) b. If the communication cost of a particular link increases due to network congestion, explain how this change would influence the least-cost paths in the network and how the routing algorithm would adjust to determine the new optimal paths. (2)	4	10	4	3

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