

# Continuous Assessment Test (CAT) – I - JANUARY 2025

Programme	: B. Tech (CSE and its specialisations)	Semester	: Winter 24-25
Course Code & Course Title	: BCSE308L – Computer Networks	Class Number	: CH2024250501770 CH2024250502124 CH2024250502306 CH2024250502307 CH2024250503127
Faculty	: Dr. PRADEEP K V Dr. MENAKA PUSHPA A Dr. SHYAMALA L Dr. DINAKARAN M Dr. SANGEETHA N	Slot	: D1+TD1
Duration	: 1½ Hours	Max. Mark	: 50

## General Instructions:

- Write only your registration number on the question paper in the box provided and do not write other information.
- Only non-programmable calculator without storage is permitted

## Answer all questions

Q. No	Sub Sec.	Description	Marks
1.		<p>An organization wants to securely transmit sensitive data between two branch offices over the Internet. However, they face the following challenges:</p> <ol style="list-style-type: none"> <li>Data packets are occasionally lost during transmission between process-to-process communication.</li> <li>Hackers may try to intercept the data during transmission.</li> <li>The transmitted data must reach the destination without corruption and in the correct order.</li> <li>Employees from both branches need to authenticate themselves before exchanging data.</li> </ol> <p>Based on the Open system interconnection model, identify the layers responsible for handling each challenge and explain how each layer contributes to solve the problem. Suggest real-world protocols or technologies for each solution with a neat diagram</p>	10
2.		<p>Consider that you are a network engineer of ABC company. You are involved in designing a network topology for a University Campus. The campus consists of multiple buildings which include an Administrative block, Academic buildings, Library, Hostel blocks, and Data center. The data center acts as a central hub for the entire campus network consisting of host servers, databases and firewalls. The administrative block comprises of HR and Accounts departments which requires secure and reliable network connections for managing sensitive data. Each academic building contains multiple classrooms and labs that require stable internet access for student devices and lab equipment. Library offers access to online databases and e-books with high bandwidth demands for</p>	10



		students and needs a dedicated network to support laptops, tablets and phones. Hostels must have a network capable to provide internet access to thousands of students. Propose a Hybrid topology design for the University network. Explain in detail how each building is connected and which topology is suggested for each building and why? Mention its features and how much secure is your network design.	
3.		<p>i. Calculate the latency (total delay from first bit sent to last bit received) for the following: Sender and receiver are separated by two 1-Gigabit/s links and a single switch. The packet size is 5000 bits, and each link introduces a propagation delay of 10 microseconds. Assume that the switch begins forwarding immediately after it has received the last bit of the packet and the queues are empty. [4 marks]</p> <p>ii. Suppose a signal travels through a transmission medium and its power reduced to one-third. Calculate the attenuation. [3 marks]</p> <p>iii. Compute the number of signal levels required to transmit 256 kbps over a noiseless channel with a bandwidth of 20 kHz. [3 marks]</p>	10
4.		<p>i. Compare the delay in sending an <math>x</math>-bit message over a <math>k</math>-hop path in a circuit-switched network and in a packet-switched network. The circuit setup time is <math>s</math> sec, the propagation delay is <math>d</math> sec per hop, the packet size is <math>p</math> bits, and the data rate is <math>b</math> bps. Under what conditions does the packet network have a lower delay? Also, explain the conditions under which a packet-switched network is preferable to a circuit-switched network. [4 Marks]</p> <p>ii. When the packet arrives packet switch, what information in the packet does the switch use to determine the link onto which the packet is forwarded? Explain it with a neat sketch. [3 Marks]</p> <p>iii. How is packet switching on the Internet similar to driving from one city to another and asking for directions during the journey? [3 Marks]</p>	10
5.		<p>Consider the following data blocks transmitted over a network: 10011001, 01100000, 00100100, 10000100.</p> <p>i. Explain the process of calculating the checksum at the sender's side and generate the codeword.</p> <p>ii. At the receiver's side the following codeword is received: 10011001, 01100000, 00100100, 10000100, 01011001</p> <p>Verify the integrity of the received data using the checksum verification process. Explain the steps involved in verifying the checksum. Analyze whether the data blocks or the checksum were altered during transmission. Identify where the error occurred.</p>	10