

Final Assessment Test – November 2025Course: **BCSE308L - Computer Networks**Class NBR(s): **1465/1471/1479/1485/1498/1502/1507/
1511/1518/1520/1522/1527/1531/1536/1540/1545/
1549/1552/4055/4819**Slot: **F2+TF2**Time: **Three Hours**Max. Marks: **100**

- **KEEPING MOBILE PHONE/ANY ELECTRONIC GADGETS, EVEN IN 'OFF' POSITION IS TREATED AS EXAM MALPRACTICE**
- **DON'T WRITE ANYTHING ON THE QUESTION PAPER**

COs	CO Statements
CO1	Interpret the different building blocks of Communication network and its architecture.
CO2	Contrast different types of switching networks and analyze the performance of network.
CO3	Identify and analyze error and flow control mechanisms in data link layer.
CO4	Design sub-netting and analyze the performance of network layer with various routing Protocols.
CO5	Compare various congestion control mechanisms and identify appropriate transport layer protocol for real time applications with appropriate security mechanism.

BL – Blooms Taxonomy Level (1 – Remember, 2 – Understand, 3 – Apply, 4 – Analyse, 5 – Evaluate, 6 – Create)

Answer ALL Questions

(10 X 10 = 100 Marks)

1. Consider that you are assigned with setting up a new online chat application where the communication between the client and the server occurs via OSI Layers. There are one router and one switch are placed between client and server. CO5 BL2
- a) Explain the working of OSI model in proper order with the protocols involved in each layer. [7]
- b) Draw OSI architecture diagram from client to server including switch and router. [3]
2. You are working in a communication expert group. Your senior described the following problems and asking you to provide which data rate is efficient. CO4 BL2
- “A path in a digital circuit-switched network has a data rate of 2 Mbps. The exchange of 1500 bits is required for the setup and teardown phases. The distance between two parties is 4000 km. The propagation speed is 2×10^8 m/s.
- Answer the following questions:
- What is the total delay if 2000 bits of data are exchanged during the data transfer phase?
 - What is the total delay if 500,000 bits of data are exchanged during the data transfer phase?
 - What is the total delay if 5,000,000 bits of data are exchanged during the data transfer phase?”
 - Provide brief conclusion on efficiency of data transfer based on above computation.

3. Consider the below network scenario:
 Host A connected to R1, R1 connected to R2, R2 connected to Host B in P2P topology. MTU: Host A to R1: 3500, R1 to R2: 2500, Host B to R2: 1500
 Suppose that the Host A sends a datagram of size 8400 bytes to Host B.

- i. How many fragments the segments will be decomposed by router R1 and R2? [1]
- ii. What are the fragmentation fields will be updated at router R1 and R2? [2]
- iii. Show the IPv4 header format for each fragmented data along with the modified fragmented values. [4]
- iv. How many fragments are received by host B? Show the detailed calculation. [3]

4. Consider an ISP is granted with a site address 180.0.0.0/16. It is decided to distribute the addresses to the company which has four branches in four major cities based on the following requirements.

CO1 BL3

- i. Branch1 located in Mumbai has 50 customers each needs 128 addresses.
- ii. Branch2 located in Chennai has 100 customers each needs 64 addresses.
- iii. Branch3 located in Bangalore has 100 customers each needs 32 addresses.
- iv. Branch4 located in Delhi has 50 customers each needs 256 addresses.
- v. Find the number of addresses available after allocation.

5. A large data centre experiences network slowdown due to congestion during peak traffic. As an expert in networking, provide detailed report on open loop and closed loop congestion based methodologies. Provide detailed answer on how these methods help in preventing and mitigation the congestion in the network. Also mention which method is optimal and why?

CO5 BL4

- i. A leaky bucket has a capacity of 100 packets and leaks at a rate of 10 packets/sec. If 50 packets arrive every second for 5 seconds, how many packets will be dropped? 240 [2.5] CO4 BL5
- ii. Design a leaky bucket system for a network router that receives bursts of 200 packets every 10 seconds. The goal is to smooth traffic to 20 packets/sec. What should the bucket size be to avoid packet drops? [2.5]
- iii. A video server uses a leaky bucket to send data at a constant rate of 5 Mbps. If the incoming stream fluctuates between 2 Mbps and 10 Mbps, what happens when the input exceeds the leak rate? [2.5]
- iv. A token bucket adds 1 token every 100 ms and holds up to 50 tokens. How many requests can be sent in a burst if each request consumes 1 token? Hint: Maximum burst = bucket capacity. [2.5]

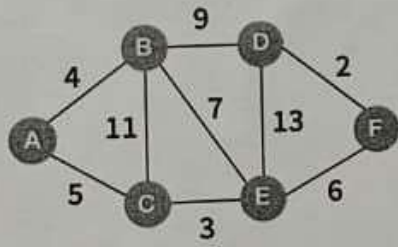
- 7. i. There are millions of users try to access our VIT website www.vit.ac.in at the same time during admission counselling. Demonstrate with a neat diagram: How DNS caching helps to improve the web performance and reduce the server load under this heavy query condition? [5] CO5 BL3
- ii. Alice sends an email to Bob using her mail client. Illustrate with a neat diagram how the message is transmitted using SMTP over TCP, from Alice's computer to Bob's mailbox. [5]

8. A university's IT department is responsible for managing its network, which includes routers, switches, and servers spread across multiple campuses. To ensure smooth operation, they have implemented SNMP for real-time monitoring and troubleshooting. CO2 BL5

One morning, the Network Management System (NMS) receives multiple TRAP alerts from different routers, indicating high packet loss and CPU utilization. The IT administrator needs to diagnose and resolve the issue using SNMP functionalities.

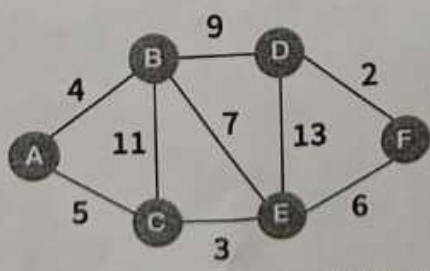
- i. Identify and explain the role of each functional component of SNMP in this scenario. [5]
- ii. Demonstrate various SNMPV3 messages exchanged between them by showing the format of each. [5]

9.a) Find shortest path from Source node 'A' to all other nodes using Dijkstra's Algorithm for the autonomous network diagram shown below. CO4 BL4



OR

9.b) A network administrator is implementing distance vector routing in a network where each router shares its routing table with neighbour's periodically. However, due to frequent topology changes, link failures occur, requiring updates to be propagated efficiently. In the below network, Node 'A' is the source, and the administrator needs to find the shortest path from Node 'A' to all other nodes using the Bellman-Ford algorithm. CO4 BL4



- i. Explain the working of distance vector routing. [3]

- ii. Using the Bellman-Ford Algorithm, compute the shortest path from source node 'A' to all other nodes in the given network topology. Show all steps, including distance updates in each iteration. [5]
- iii. Discuss about how the node and link failures are detected and how are they addressed in distance vector routing. [2]

10.a) You are developing a chat application where Hamming Code is used as an error correction technique to ensure reliable data transmission. The app sends 8-bit binary messages from sender to receiver, utilizing even parity for error detection and correction. A message 10101011 is prepared for transmission. At the sender's side, Hamming code is applied to encode the message with parity bits before sending it to the receiver. At the receiver's side, the message is received, but due to transmission errors, the 6th bit gets corrupted. The system must detect and correct the error using Hamming Code.

CO3 BL4

- i. Determine the data to be transferred from the sender's side after applying hamming code with even parity (show all steps). [5]
- ii. If the 6th bit is received incorrectly, demonstrate how the hamming code detects and corrects the error at the receiver's side. [5]

OR

- 10.b) i. A remote sensor station uses Selective Repeat ARQ with a 4-bit sequence number to transmit sensor data (temperature readings) to a central monitoring system. The following sequence of events occurs during transmission:
- The sensor station sends Frames 0, 1, 2, 3, and 4 to the monitoring system.
 - In which, the Frame 1 is lost during transmission, the acknowledgement of Frames 2 is lost, and the acknowledgement of Frame 3 expires due to timeout.
- Discuss the Selective Repeat ARQ protocol and draw the timing diagram for this scenario, includes the lost frames, retransmissions, and delays in acknowledgment handling.
- ii. Which CSMA is suitable for ethernet? Why? Justify your answer with valid key points. [4]

CO3 BL4

⇔⇔⇔ B/L/TY ⇔⇔⇔