


VIT[®]

Vellore Institute of Technology
(Approved to be a University under section 3 of the U.G.A. Act, 1956)
Final Assessment Test – April 2026

Course: **CBS3001** - Computer Networks

Class NBR(s): **2088/2323**

Time: **Three Hours**

Slot: **C2**

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 analyse the performance of network.
CO3	Implement various error detection and correction mechanisms, flow control mechanisms and various routing protocols.
CO4	Design subletting and analyse the performance of network layer, Construct and examine various routing protocols.
CO5	Understand the functionality of various layer and its associated protocols.

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

Answer ALL Questions

(10 X 10 = 100 Marks)

- An employee in a company sends an email with attachments to a client using an email application. The email message travels through several interconnected networks before reaching the destination system. During transmission, the data is processed through different layers that perform tasks such as data formatting, logical addressing, routing, and physical transmission. The network administrator explains that these operations follow a layered communication structure. To understand how the data moves from sender to receiver, the administrator.

a) Identify the network reference model used in this communication and draw and explain the architecture.

b) Explain the functions of the Transport Layer and Network Layer in ensuring the successful delivery of the email.

CO1 BL2
- a) A cellular communication system operates using two separate frequency bands. The uplink band ranges from 890 MHz to 915 MHz for transmitting signals from mobile users to the base station, while the downlink band ranges from 935 MHz to 960 MHz for receiving signals. Each user is allocated a channel bandwidth of 25 kHz in each direction. How many people can use their cellular phones simultaneously?

b) Define the following terms used in multiplexing techniques: Empty Slot, Multilevel Multiplexing, and Multiple slot Multiplexing. Explain each concept with a neat diagram.

[5] CO2 BL3
- A sender wants to transmit the data word 1101111011 to a receiver using the Cyclic Redundancy Check (CRC) technique for error detection. The generator polynomial is given as $G(X) = X^4 + X^2 + 1$. Generate the CRC code word for the given data. Then introduce an error by flipping the 5th bit from the left in the transmitted code word and verify the transmission at the receiver side for both cases: with error and without error.

CO3 BL3

4. An ISP is assigned the network address 176.18.0.0/16 and plans to distribute IP addresses to four branch offices located in different cities. The ISP needs to distribute these addresses to several groups of customers as follows:

Branch 1 (Hyderabad): 60 customers, each requiring 64 IP addresses.

Branch 2 (Kolkata): 120 customers, each requiring 32 IP addresses.

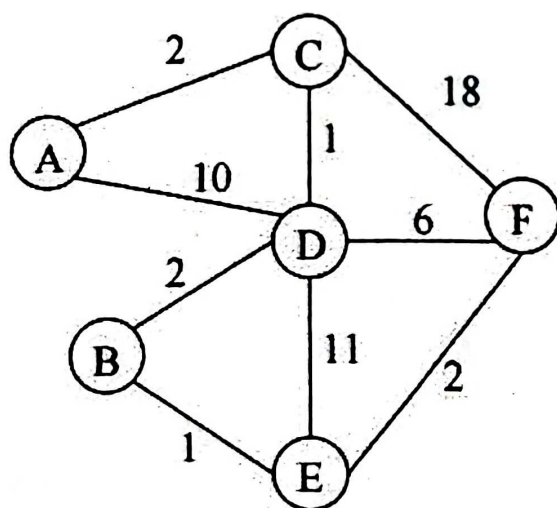
Branch 3 (Pune): 80 customers, each requiring 128 IP addresses.

Branch 4 (Ahmedabad): 40 customers, each requiring 256 IP addresses.

Draw a subnet allocation diagram showing how the 176.18.0.0/16 block is divided among all groups. Find total assigned address and remaining address.

5. In a smart city traffic management system, different control centres are connected through a packet-switched network to monitor and manage traffic flow. The centres include Traffic Control (A), Signal Monitoring (B), Accident Response (C), Surveillance (D), Parking Management (E), and Public Transport Control (F). Each centre is connected through communication links, and each link has an associated cost representing network delay, bandwidth usage, or congestion.

Assume Traffic Control Centre (Node A) is the source node, which has direct links to Signal Monitoring and Surveillance, along with other interconnections among the remaining centres as defined in the network graph.



Show all intermediate steps of distance vector updates, construct the routing table at Node A after each iteration, and indicate the final shortest paths.

6. Explain the TCP (Transmission Control Protocol) header format with a neat diagram and describe the functions of its various fields. Also discuss the role of sequence numbers in ensuring reliable and ordered data delivery in TCP. In addition, explain any two TCP congestion control methods used to manage network traffic.

7. A leaky bucket has a capacity of 180 packets and leaks at a rate of 12 packets/sec. If 60 packets arrive every second for 6 seconds, how many packets will be dropped? CO5 BL3

- a) Design a leaky bucket system for a network router that receives bursts of 240 packets every 12 seconds. The goal is to smooth traffic to 24 packets/sec. What should the bucket size be to avoid packet drops? [4]
- b) A video server uses a leaky bucket to send data at a constant rate of 6 Mbps. If the incoming stream fluctuates between 3 Mbps and 12 Mbps, what happens when the input rate exceeds the leak rate? [3]
- c) A token bucket adds 1 token every 80 ms and holds up to 60 tokens. How many requests can be sent in a burst if each request consumes 1 token? [3]

Hint: Maximum burst = bucket capacity.

- 8.a) Explain the World Wide Web (WWW) and describe its architecture and working mechanism. Also discuss the roles of web browsers, web servers, URLs, and HTTP in accessing web pages. CO2 BL2

OR

- 8.b) Explain the working of the E-mail system in computer networks. Describe the components involved in sending and receiving emails, and explain the role of protocols such as SMTP, POP3, and IMAP with a neat diagram. CO2 BL2

9. A healthcare organization stores confidential patient records in its computer network. Recently, the administrator observed that unauthorized users attempted to access sensitive medical data during transmission between different departments. To protect the data and ensure secure communication, the organization decided to implement encryption techniques and authentication mechanisms in the network. CO4 BL3

Explain how encryption helps in securing data during transmission in computer networks. Describe the role of authentication mechanisms in preventing unauthorized access to network resources. Discuss how the combined use of encryption and authentication improves overall network security.

- 10.a) Explain the Pure ALOHA and Slotted ALOHA protocols used in computer networks. Compare them in terms of working principle, throughput, and vulnerable time, and illustrate the differences with suitable diagrams. CO3 BL2

OR

- 10.b) Explain the CSMA/CD (Carrier Sense Multiple Access with Collision Detection) and CSMA/CA (Carrier Sense Multiple Access with Collision Avoidance) protocols used in computer networks. Compare their working principles, collision handling mechanisms, and applications with suitable examples. CO3 BL2