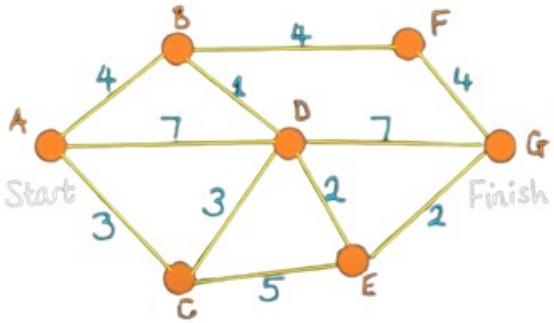
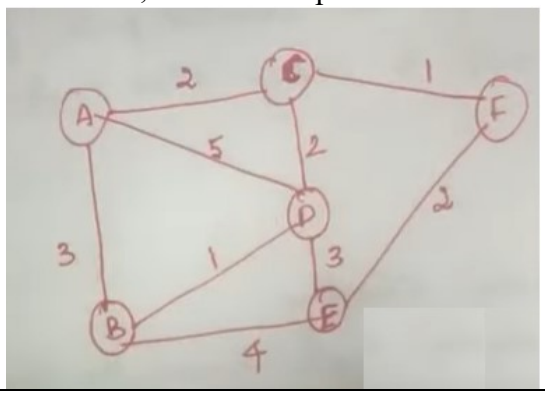
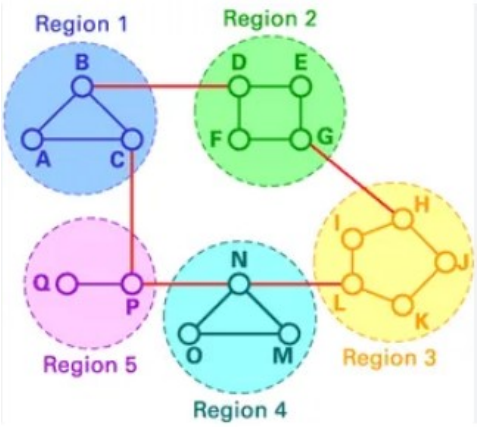
	R V College of Engineering Department of Computer Science and Engineering CIE 2 : Question Paper	
Course : (Code)	**Computer Networks(21CS45)**	**Semester : IV**
Date : 29 /08/2023	**Duration :** 120 minutes	**Staff : SUN**

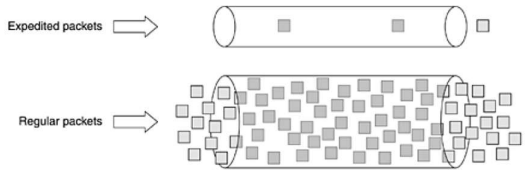
Sl.no.	Part A	Marks	BT	CO
1	What is the main objective of hierarchical routing in computer networks? Mention the advantages.	02	L1	
2	Explain the concept of "split horizon" in Distance Vector Routing	02	L2	
3	Explain the concept of "congestion collapse" in computer networks. Mention the disadvantages.	02	L2	
4	Mention when can Flow-Based QoS and Class-Based QoS be used?	02	L2	
5	With a diagram explain Expedited Forwarding	02	L2	
	Part B			
1a	Explain the Count-to-Infinity Problem.	03	L2	CO1
1b	Apply shortest path algorithm to the below graph. Show the steps in detail. 	07	L3	CO1
2a	For the below given network, write all the possible link state packets. 	03	L2	CO1

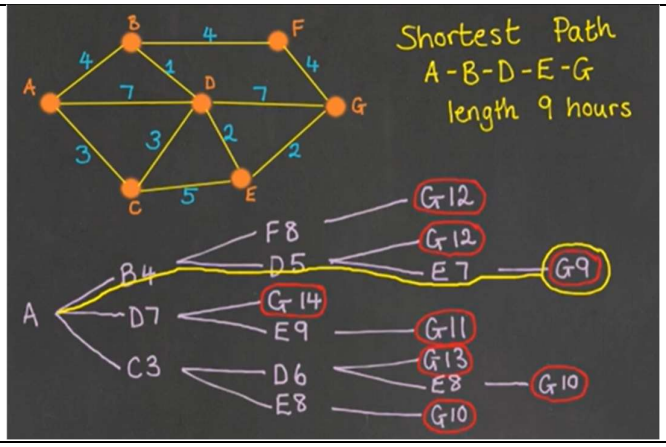
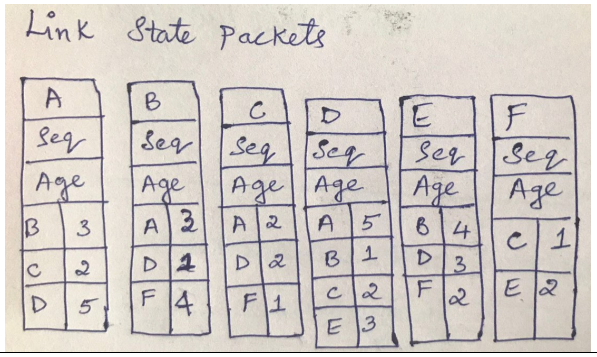
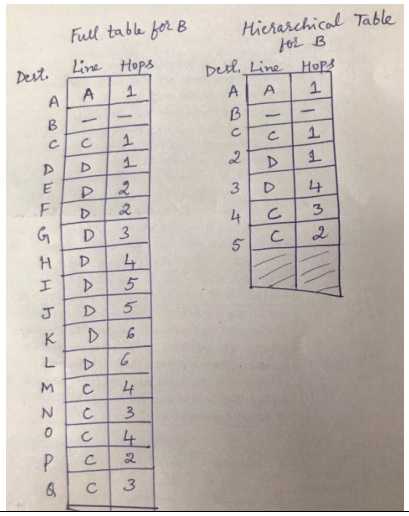
2b	Assume that a network has grown to a point where it is no longer feasible for every router to have an entry for every other router. In such a situation which routing algorithm is preferred? Apply the same algorithm for the below network. Draw suitable routing tables for router B.  	07	L3	CO3
3.a	Compare and contrast leaky bucket algorithm and token bucket algorithm.	04	L4	CO1
3.b.	Explain the Resource reservation protocol with suitable diagram of the network.	06	L2	CO4
4	Define quality of service. Briefly explain the different techniques used for achieving good quality of service.	10	L2	CO1
5a	Outline the implementation of data flow for assured forwarding with diagram.	03	L2	CO2
5b	What happens when the network nodes or links become overloaded with data, leading to a degradation in performance and increased delays? How can this situation be controlled in Virtual-Circuit Subnets and Datagram Subnets.	07	L1	CO3

COURSE OUTCOMES:

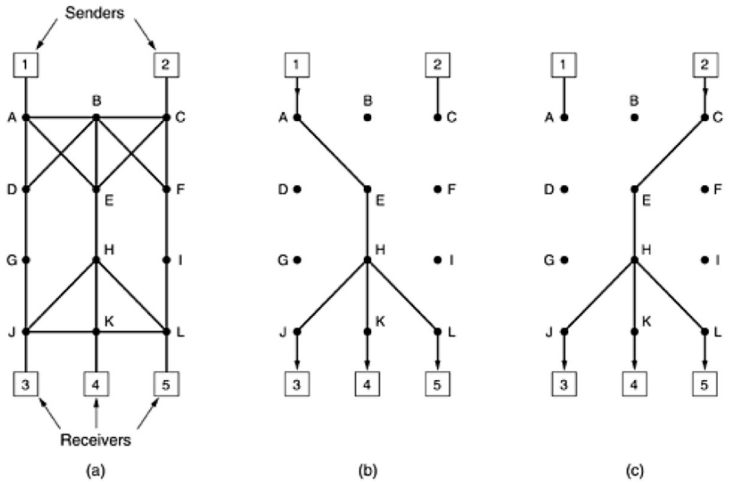
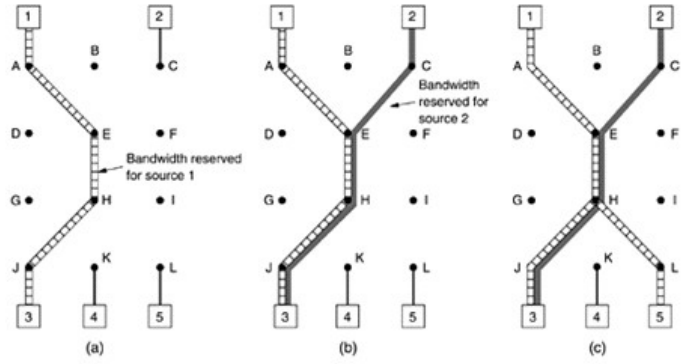
CO1.	Apply the algorithms/techniques of routing and congestion control to solve problems related to Computer Networks.
CO2.	Analyse the services provided by various layers of TCP/IP model to build effective solutions
CO3.	Design sustainable networking solutions with societal and environmental concerns by engaging in lifelong learning for emerging technology.
CO4.	Exhibit network configuration, protocol usage and performance evaluation in networks.
CO5.	Demonstrate the solutions using various algorithms/protocols available to address networking issues using modern tools by exhibiting team work and effective communication.

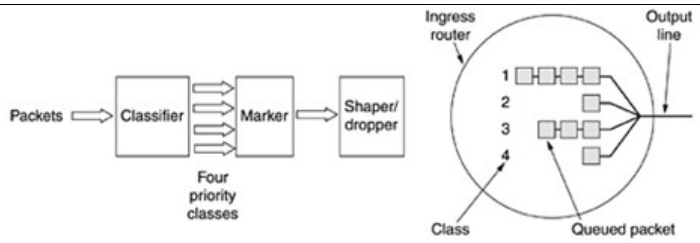
	L1	L2	L3	L4	L5	L6	CO1	CO2	CO3	CO4	CO5
Marks	7	25	14	4	-	-	27	3	14	6	-

COMPUTER NETWORKS Scheme and Solution		
SL No.	**Answer**	**Marks**
1	The main objective of hierarchical routing is to divide a large network into smaller, manageable subnetworks or domains to improve scalability and reduce the complexity of routing.	02
2	Split horizon is a technique used in Distance Vector Routing protocols to prevent routing loops. It involves a router not advertising a route back to the neighbour from which the route was learned. This helps to avoid incorrect routing information from being propagated and reduces the likelihood of loops in the network	02
3	Congestion collapse refers to a severe degradation in network performance caused by excessive congestion. It occurs when the network becomes overwhelmed with traffic, leading to packet loss, long delays, and reduced throughput. Congestion collapse can significantly impact the quality of service for users and applications.	02
4	**Flow-based QoS** is suitable when there is a need to provide highly differentiated treatment to individual flows. It is often used for real-time applications like VoIP and video conferencing, where each flow requires specific QoS guarantees. **Class-based QoS** is more commonly used when traffic can be aggregated into classes with similar requirements. It is efficient for prioritizing different types of traffic in a more general way, such as giving higher priority to mission-critical applications or bulk data transfers.	02
5	Two classes of services are available: regular and expedited. The vast majority of the traffic is expected to be regular, but a small fraction of the packets are expedited. The expedited packets should be able to transit the subnet as though no other packets were present. ***Figure 5-39. Expedited packets experience a traffic-free network.*** 	02
1a	The "Count-to-Infinity" problem is a scenario that can occur in computer networking protocols, particularly in distance-vector routing algorithms such as the Routing Information Protocol (RIP). It arises when there is a network topology change, but the routing information does not propagate quickly or efficiently throughout the network. This can result in routers incorrectly believing that they have found the shortest path to a destination and creating routing loops. The Count-to-Infinity problem can result in significant network instability, increased network traffic, and delayed convergence. It is a fundamental limitation of distance-vector routing algorithms that do not have mechanisms to detect and prevent routing loops.	03

1b		07
2a		
2b		
3a		04

Parameter	Leaky Bucket	Token Bucket
Token Dependency	Token independent.	Dependent on Token.
Filled bucket for token	When bucket is full, data or packets are discarded.	If bucket is full, token are discard not packets.
Packet transmission	Leaky bucket sends packets at constant rate.	Token bucket can send large burst of packets at faster rate.
Condition for packet transmission	In Leaky bucket algorithm, Packets are transmitted continuously.	In Token bucket algorithm, Packets can only transmit when there is enough token.
Token saving	It does not save any token.	It saves token for the burst of packet transmission.
Restrictive Algorithm	Leaky bucket algorithm is more restrictive as compared to Token bucket algorithm.	Token bucket algorithm is less restrictive as compared to Leaky bucket algorithm.

3b	**RSVP—The Resource reSerVation Protocol** RSVP stands for "Resource Reservation Protocol." It is a signalling protocol used in computer networks to establish and maintain resource reservations for specific data flows, ensuring Quality of Service (QoS) guarantees in IP-based networks. RSVP is a crucial component of the Integrated Services (IntServ) architecture, which aims to provide end-to-end QoS for individual data flows. ***(a) A network. (b) The multicast spanning tree for host 1. (c) The multicast spanning tree for host 2.***  ***(a) Host 3 requests a channel to host 1. (b) Host 3 then requests a second channel, to host 2. (c) Host 5 requests a channel to host 1.***  Explanation -	Exp-04 Diag-02
4	Quality of Service (QoS) refers to a set of techniques and mechanisms that are used to manage and improve the performance of data transmission in a network. It is a crucial aspect of computer networking, especially in scenarios where different types of traffic need to be prioritized based on their importance, characteristics, or requirements. **Techniques (explain)** 1. Overprovisioning 2. Buffering 3. Traffic Shaping 4. The Leaky Bucket Algorithm 5. The Token Bucket Algorithm 6. Resource Reservation 7. Admission Control 8. Proportional Routing 9. Packet Scheduling	02 08

5a	 **Step 1** classify the packets into one of the four priority classes. This step might be done on the sending host (as shown in the figure) or in the ingress (first) router. The advantage of doing classification on the sending host is that more information is available about which packets belong to which flows there. **Step 2** mark the packets according to their class. A header field is needed for this purpose. **Step 3** pass the packets through a shaper/dropper filter that may delay or drop some of them to shape the four streams into acceptable forms.	01 02
5b	Congestion occurs Congestion Control in Virtual-Circuit Subnets Congestion Control in Datagram Subnets - Warning Bit, Choke Packets, Hop-by-Hop Choke Packets	01 02 04