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Roll No.: _ _ _ _ _ _ _ _ _ _

Amrita Vishwa Vidyapeetham, Amritapuri

B.Tech Degree Examination – May 2023

Sixth Semester

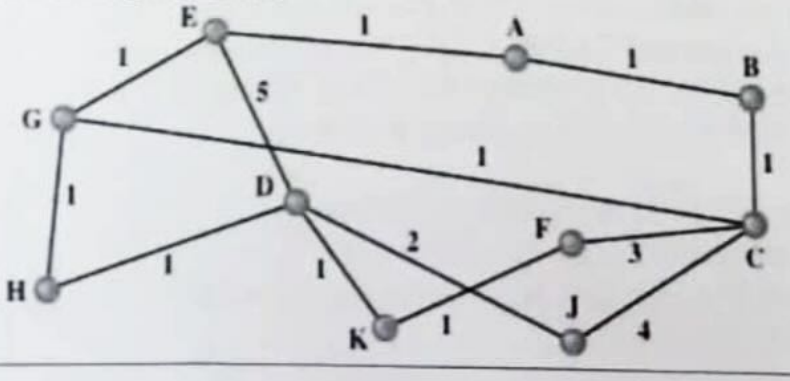
ECE A and B (Core Course)

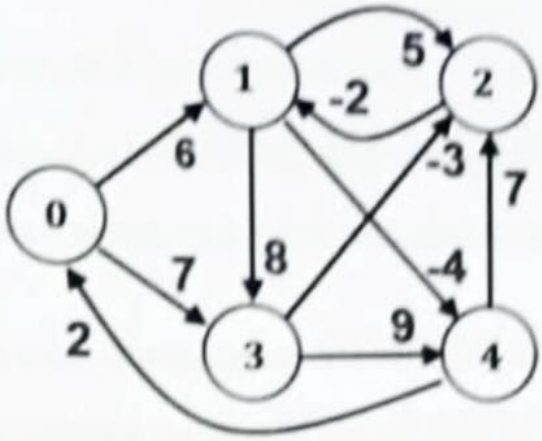
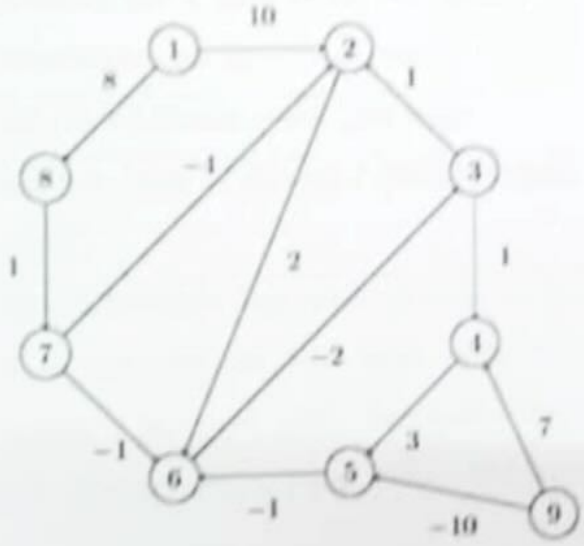
19ECE311 – Computer Networks

Time: 3 hours

Maximum Marks: 100

Qn. No.	Questions	Marks	CO	Bloom's Taxonomy
1	Which model describes a 4-layered architecture that computer systems use to communicate over a network? State the layers and explain all the associated functionalities.	**10**	CO1	L1
2	As the lead coordinator of technical events of Vidyut Multifest 2024, you are designated the task of organizing an offline mobile gaming arena to replicate the game *Clash of Clans*. How would you set up the network infrastructure for this gaming scenario? With appropriate diagrams and detailed explanations, present the network design highlighting the topology, communication media and other relevant design considerations to be implemented for the gaming environment. [Hint: *Clash of Clans* is an online multiplayer game in which players form communities called clans, train troops, and attack other players to earn resources. The minimum number of players for a multiplayer scenario is assumed to be 30. Present the network design with all relevant considerations. You are free to assume parameters that are not provided; however, state all your assumptions clearly.]	**10**	CO1, CO2	L1, L2, L3
3	You are required to design a mini-WAN (wide area network) consisting of four LANs (local area networks). The gateway routers of the LANs are connected using ring topology. The hosts in each LAN are to be assigned IP addresses from the address pool 200.20.10.0/24. LAN 1 consists of 31 nodes, LAN 2 contains 27 nodes, LAN 3 hosts 15 nodes and LAN 4 contains 6 hosts and the links between the routers belong to 4 different networks. For the above network scenario, answer the following questions. A) Draw the network topology for the mentioned network. B) How many subnets are present in the above network? C) Design an appropriate IP assignment scheme and list the ranges of IP addresses for all the networks.	**10**	CO2	L1, L3

4	For N=4, L=3200, B=9600, P=1024, H=16, S=0.2 and D=0.001, compute the end-to-end delay for circuit switching, virtual circuit packet switching and datagram packet switching. Assume that there are no acknowledgments. Ignore processing delay at the nodes. [Parameters are defined as given: N = number of hops between two given end systems, = message length in bits, B = data rate, in bits per second 1bps2, on all links, P = fixed packet size, in bits, H = overhead 1header2 bits per packet, S = call setup time 1circuit switching or virtual circuit2 in seconds, D = propagation delay per hop in seconds]	**10**	CO2	L5
5	a) Derive the expression for the performance of the Slotted Aloha Protocol. b) For two nodes A and B in a network, contending for channel access using the CSMA protocol, show and explain the implementation of the binary exponential back-off algorithm up to 4 iterations, if B emerges as the winner gaining access to the channel at the end of the first iteration. Thereafter, A and B alternately wins access to the channel.	**10**	CO3	L1, L3
6	a) A network with one primary and four secondary stations uses polling. The size of a data frame is 1000 bytes. The size of the poll, ACK, and NAK frames are 32 bytes each. Each station has 5 frames to send. How many total bytes are exchanged if each station can send only one frame in response to a poll. b) Derive the expression for the efficiency of the Early Token Reinsertion strategy of the Token Passing protocol.	**10**	CO3, CO4	L2, L5
7	a) State the advantages and disadvantages of the Adaptive Routing strategy. (4) b) Find the minimum spanning tree of the following graph using Kruskal's algorithm. (6) 	**10**	CO3, CO4	L1, L4

8	Implement the Djikstra's algorithm to compute the shortest path route from the source node **0** to destination node **4**. 	**10**	CO4	L1, L2, L5
9	Apply Bellman-Ford algorithm for the following undirected graph to find the shortest path route from node A to node F. 	**10**	CO4	L2, L4
10	a) How does the Stop and Wait flow control protocol work? What are the advantages of the mentioned protocol? (4) b) What is the relationship between the sender window size and sequence number for the Go-Back-N protocol? c) In the Selective Repeat protocol, suppose frames numbered from 0 to 6 have been transmitted. As per channel conditions at the time of transmission, frame 0 times out and a new frame is transmitted, frame 1 times out, frame 2 also times out and another new frame is transmitted. At this point, what will be the outstanding packets in the sender's window?	**10**	CO4	L3, L5