VIT

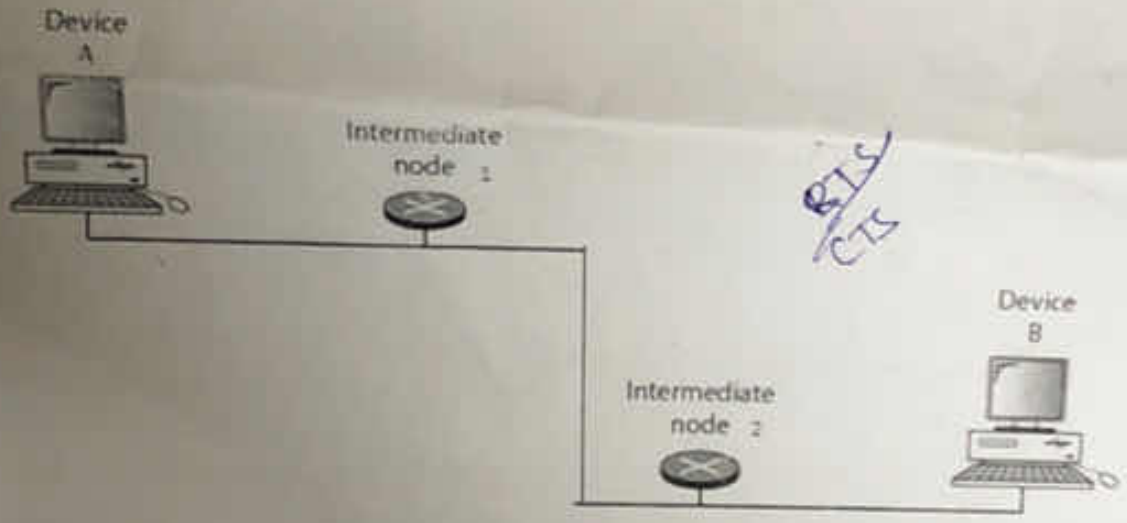
Final Assessment Test (FAT) – June 2022

Programme	B.Tech	Semester	SUMSEM12021-22
Course Title	NETWORK AND COMMUNICATION	Course Code	CSE1004
Faculty Name	Prof. Sahaya Beni Prathiba B	Slot	A1+A2+TA1+TA2
Time	3 Hours	Class Nbr	CH2021228000244
		Max. Marks	100

Part A (10 X 10 Marks)

Answer All questions

1. Consider the below figure, which has two devices A and B connected with two intermediate nodes, where device A and intermediate node 1 are located on the first floor of a library and device B and the intermediate node 2 are located on the ground floor of the same library. The intermediate nodes are connected with a coaxial cable. Imagine the readers' detail and their updates from the first floor has to be sent to the ground floor of the library. Explain both diagrammatically and theoretically the various layers of these devices and justify how the communication happens in this scenario. Also, justify whether direct communication is possible rather than layer-by-layer communication. [10]



2. Consider sender A wanted to send a sensitive message to receiver B. The polynomial representation of the sensitive message is x^4+x^3+1. Since this is a sensitive message, the sender expects the transmission without any error (i.e. even though the network detects the error, it should correct it before transmitting). Imagine the network provider uses even parity hamming code generator. If so, justify how redundancy bits will be generated for the data x^4+x^3+1? Explain the entire process with step by step procedure involved. [10]

3. Assume that you bought a new network access point with the ISP Airtel to your house. As a network design engineer, can you design the wireless network connectivity among the devices available in the home? Choose the best random access protocol/MAC protocol for the same. Justify your answer with a neat sketch. Also, explain the scenario of congestion in the same. [10]

4. Consider you are the proprietor of a Startup company named "India-Net". You are now requesting the Internet Service Provider (ISP) for providing a block of addresses to your company. One of the addresses is 165.17.37.39/28. [10]

a. How many addresses this particular address block can hold so that how many network devices can be connected with this address block? (2 marks)

b. What is the first address in the provided address block? Solve the same numerically and justify your answer with a proper explanation. (2 marks)

c. What is the last address in the provided address block? Solve the same numerically and justify your answer with a proper explanation. (2 marks)

d. What is the network address provided by the ISP to represent your company to the rest of the world? (2 marks)

e. Explain to which class the addresses belong? (2 marks)

5. Our institution VIT requires network address allocation for the various schools such as SCOPE, SENSE, SSL, and SAS. In order to obtain the same, VIT requested the ISP. After inquiring about all the required details, the ISP provided a block of network addresses which is been represented as 10.0.0.0/8. These blocks of addresses should be distributed to the available schools on the VIT campus, such that, [10]

a. SCOPE has 64 research groups and each group requires 512 addresses

b. SENSE has 32 research groups and each group requires 1024 addresses

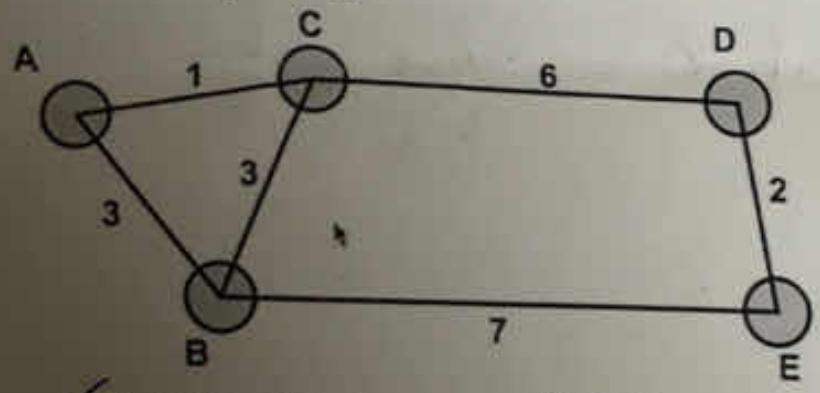
c. SSL has 16 research groups and each group requires 512 addresses

d. SAS has 32 research groups and each group requires 256 addresses.

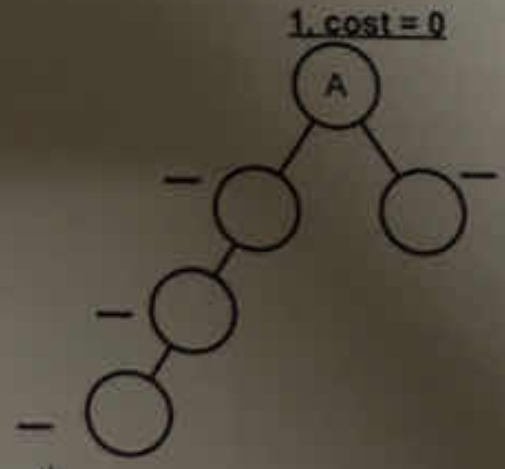
Design the subblocks and give the CIDR notation for each subblock (7 marks). Find out how many addresses are still available after these allocations (2 marks).

Also, show the benefit of this CIDR notation (1 mark).

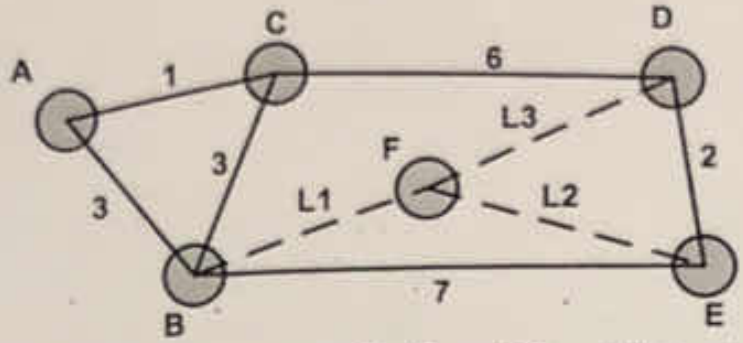
6. For the following network [10]



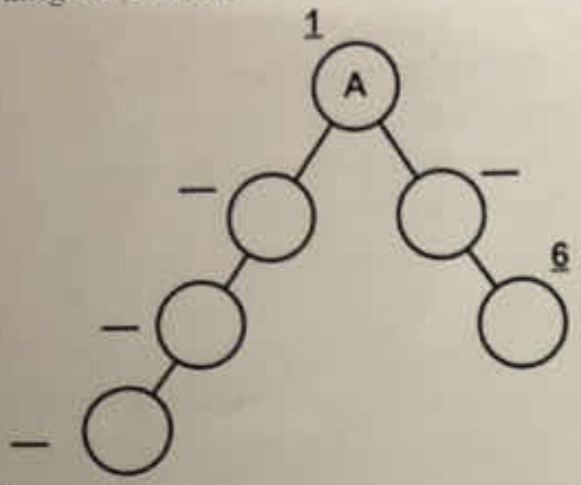
a. an empty routing tree generated by Dijkstra's algorithm for node A (to every other node) is shown below. Fill in the missing nodes and indicate the order that each node was added and its associated cost. (5 marks)



b. Now assume that node F has been added to the network along with links L1, L2, and L3.



What are the constraints on L1, L2, and L3 such that node A's routing tree must match the topology shown below (regardless of how ties are broken in the algorithm), and it is known that node F is not the last node added when using Dijkstra's algorithm? All costs are positive integers. (5 marks)



[10]

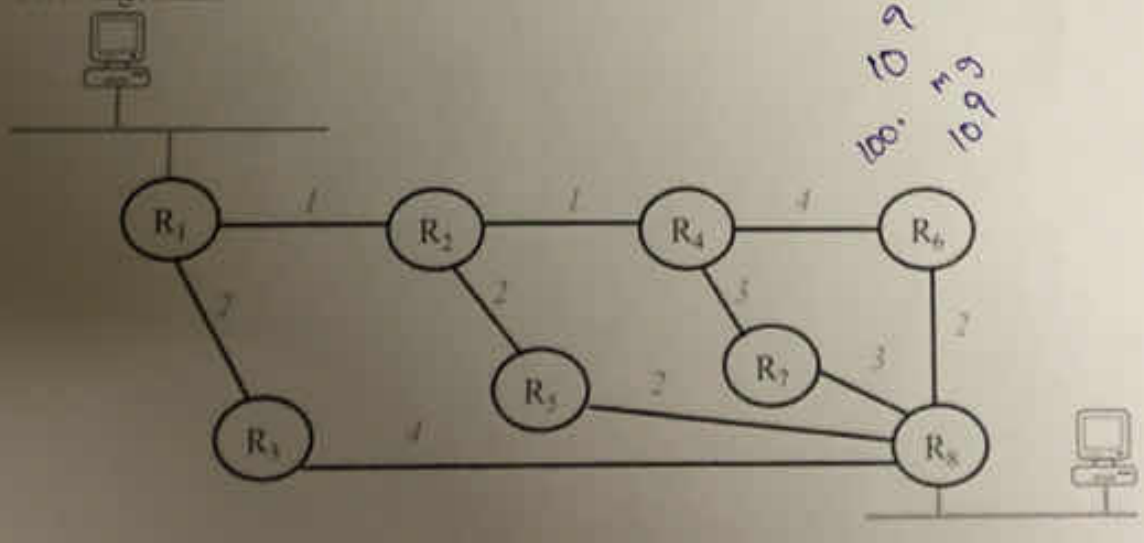
a. Sender and receiver are separated by two 1-Gigabit/s links and a single switch. The packet size is 5000 bits, and each link introduces a propagation delay of 10 microseconds. Assume that the switch begins forwarding immediately after it has received the last bit of the packet and the queues are empty. Calculate the latency. (4 marks)

b. Consider the following chain topology: A ---- B ----- C ---- D ---- E. A is sending packets to E using a reliable transport protocol. Each link above can transmit one packet per second. There are no queues or other sources of delays at the nodes except the transmission delay. Calculate the RTT between A and E. (2 marks)

c. In the same scenario of (b), if A decides to run a sliding window protocol, what is the optimum window size it must use? Calculate the throughput achieved when using this optimum window size as well. (4 marks)

[10]

Determine the route from (R1 , ..., R7) to R8 that minimizes the distance using the Distance-Vector algorithm.



9. Assume a communication between S and R. Sender S communicates with receiver R using a flow control protocol with a window of 3 packets. This means that S can send at most 3 unacknowledged packets at a time. Each packet has a sequence number starting from 1. R always acknowledges a packet by sending back to A the sequence number of that packet (i.e., when R receives a packet with sequence number 2 it sends an acknowledgment (ack) containing 2 to S.) Ignore packet transmission time, and assume that neither the packets nor the ack is reordered in the network. Let RTT denote the round-trip time between S and R. S uses two mechanisms to retransmit a packet: [10]

Assume S wants to transfer a file that spawns exactly 8 packets to R as fast as possible. During the transfer at most one packet (or ack) is lost. For all questions below express your answer in terms of T and RTT.

a. What is the minimum time it could take to transfer the file? The file transfer time is the time between the moment S sends the first packet and the moment it receives the last ack. (3 marks)

b. What is the maximum possible file transfer time assuming S uses only the "timeout" retransmission mechanism? Please give a scenario that achieves the maximum transfer time. This scenario should indicate which packet (or ack) is dropped if any. (3 marks)

c. Repeat question (b) but now assume that S uses both the "timeout" and "out-of-order ack" retransmission mechanisms. (4 marks)

10. Let us assume three students from the VIT university are selected as the university gold medalists. The Vice-Chancellor of VIT university sends an appreciation email to all the University Gold medalists. Can you explain the various application layer agents that work both on the Vice-chancellor side and the students' side in the transmission of mail with a detailed and neat sketch? [10]