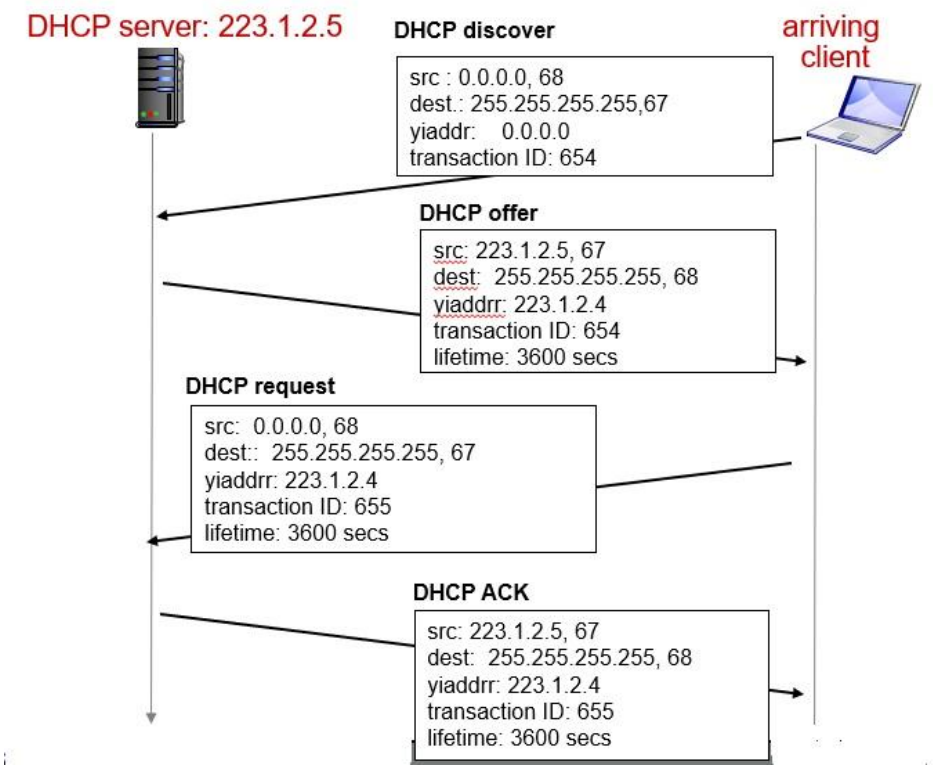
SASTRA ENGINEERING · MANAGEMENT · LAW · SCIENCES · HUMANITIES · EDUCATION DEEMED TO BE UNIVERSITY (U/S 3 of the UGC Act, 1956) THINK MERIT | THINK TRANSPARENCY | THINK SASTRA	**School of Computing** **Second CIA Examination – Mar 2025** Course Code: CSE322 Course Name: Computer Networking Principles & Components Duration: 90 minutes Max Marks: 50

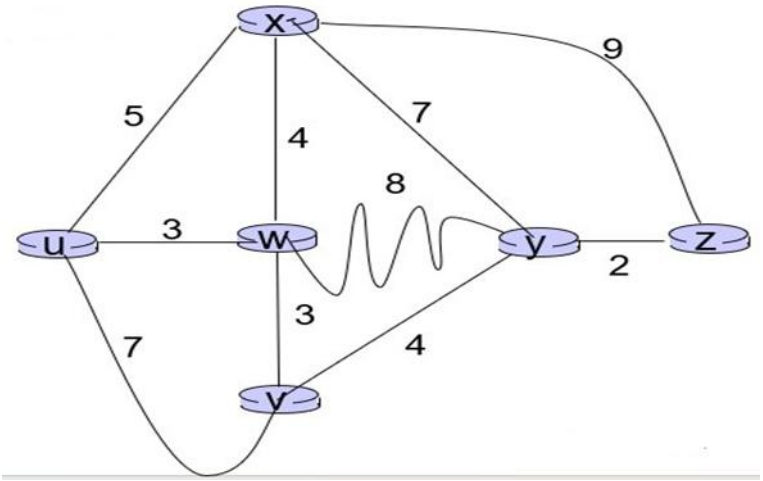
Answer Key

Q.No	Questions	Marks
1	a) If transmission delay and propagation delay in a sliding window protocol are 1 msec and 49.5 msec respectively, then: ■ What should be the sender window size to get the maximum efficiency? **100** ■ What is the minimum number of bits required in the sequence number field? **7** ■ If only 6 bits are reserved for sequence numbers, then what will be the efficiency? **64%** b) List out the advantages and disadvantages of Piggybacking. Advantages: ■ Efficient use of available channel bandwidth. ■ Reduces communication delays, benefiting real-time apps. ■ Enhances flow control in sliding window protocols. Disadvantages ■ There may be a possibility of delay in the transfer of the acknowledgment message. So if the sender does not get the acknowledgment in a fixed time, then the sender needs to resend the data. ■ This technique requires additional complexity for its implementation.	6M 4M
2	a) There are 5 stations in slotted LAN. Each station attempts to transmit with a probability P=0.2 in each time slot. What is the probability that ONLY one station transmits in a given time slot? **0.4096** b) Write short notes on Binary (Exponential) Backoff algorithm. **Backoff Procedure:** Each device involved in the collision waits for a random period before attempting to retransmit. The wait time is calculated based on the number of collisions encountered. The backoff time increases exponentially with each subsequent collision. **Exponential Growth:** The backoff time is chosen from a random range that doubles with each collision. Specifically, if the number of collisions is k, the backoff time is chosen from the interval [0, 2^k−1] slots. c) In a CSMA/CD network running at 1 Gbps over 2km cable with no repeaters, the signal speed in the cable is 400000 km/sec. What is the minimum frame size? **RTT=10 μs, Frame Size/10^9 ≥ 10×10^{-6},** **Frame Size≥$10^{-5}\times10^9$** **Frame Size≥10^4 10,000 bits or 1250 bytes**	2M 4M 4M

3	a) Compute the CSMA/CD efficiency for the given parameters: Propagation delay (tp) = 5 µs, Frame size = 1500 bytes, Data rate = 10 Mbps. **t_f =1.2 ms=1200µs, η=1/1+5×5/1200= 0.98** b) In Go back 4, if every 6th packet that is being transmitted is lost and if total number of packets to be sent is 10, then how many transmissions will be required? Show with a timeline diagram. If "every 6th packet" refers to the packet number (Packet #6), then 13 transmissions suffice. If "every 6th transmission in the entire sequence" is lost, then 17 transmissions are needed. Most likely, the problem expects 17 **Initial 4 packets (1-4) → 4 transmissions.** **Next 4 packets (5-8) → 4 transmissions (6th lost).** **Retransmit 6-9 → 4 transmissions (12th lost).** **Retransmit 6-9 again → 4 transmissions (16th succeeds).** **Under GBN's rules, when Packet 9 is lost, the sender must retransmit the entire window (6,7,8,9) because:** **It only knows the last cumulative ACK (8) and assumes everything after it is lost.** **It has no memory of past ACKs for 6,7,8.** **This inefficiency is why GBN is rarely used in practice (TCP uses Selective ACKs instead).** **Send 10 → 1 transmission.** **Total = 4 + 4 + 4 + 4 + 1 = 17 transmissions** **Time line Diagram**	4M 5M 1M
4	a) A 10 MB (Megabyte) file needs to be sent over a packet-switched network. The network link has a transmission rate of 10 Mbps (Megabits per second), and the packet size is 1 KB (Kilobyte). The propagation delay is 10 ms (milliseconds), and each packet has a processing delay of 2 ms at the router. Assume no queuing delay. Find: i. Number of packets required to transmit the file - **10240 packets** ii. Time taken to transmit one packet - **12.8192 ms** iii. Total transmission time for the entire file - **131.25 seconds** b) Under what conditions would circuit switching be a better network design than packet switching? • **Guaranteed capacity**	6M

	• **No reordering of packets** • **Bounded delay** • **No lost packets**	4M
5	a) Suppose you have a packet of 1700 bytes to be transmitted over an MTU of 1500 bytes. Show how IP fragmentation is done highlighting all the fields in Fragmentation. **The total payload size is 1700 - 20 = 1680 bytes.** **First fragment:** **Fragment Offset: 0, ID : 1,MF = 1,DF = 0** **Total Length : 1500 bytes** **Data Payload = 1500 - 20 bytes of IP header = 1480 bytes** **Second Fragment:** **Fragment Offset: 185,ID : 1,MF = 0,DF = 0** **Total Length: 220 bytes** **Data Payload = 220 bytes – 20 bytes of IP header = 200 bytes**	4M
	b) Write the range of Private IP addresses. **Class A: 10.0. 0.0 to 10.255. 255.255.** **Class B: 172.16. 0.0 to 172.31. 255.255.** **Class C: 192.168. 0.0 to 192.168. 255.255.**	2M
	c) Illustrate DORA Process in DHCP with a neat example. 	4M
6	a) How many subnets can be created and how many hosts can be connected to each subnet for the IP Address 172.16.0.0/20. Identify the class and Specify the Customized subnet mask. • Class B • CSM: 255.255.240.0 • Borrowed Bits: 4 • Number of Subnets: 2^4=16 • Hosts per Subnet: 2^{12} - 2 = 4094	3M

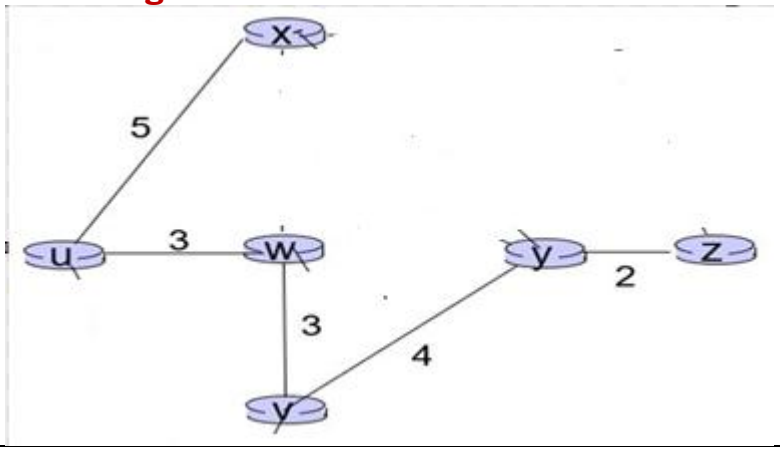
b) Apply Djikstra's algorithm to find the shortest path from U to all other nodes in the following network diagram. Show the MST diagram.



Step	N'	D(v) p(v)	D(w) p(w)	D(x) p(x)	D(y) p(y)	D(z) p(z)
0	u	7,u	3,u	5,u	∞	∞
1	uw	6,w		5,u	11,w	∞
2	uwx	6,w			11,w	14,x
3	uwxv				10,v	14,x
4	uwxvy					12,y
5	uwxvyz					

5M

MST Diagram



2M

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