U.S.N.										

B.M.S. College of Engineering, Bengaluru-560019

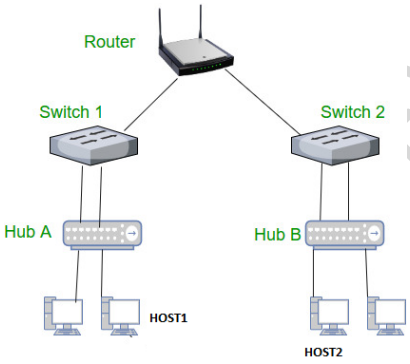
Autonomous Institute Affiliated to VTU

June 2025 Semester End Main Examinations

Programme: B.E. **Semester: V**
Branch: Information Science and Engineering **Duration: 3 hrs.**
Course Code: 23IS5PCCN1/22IS5PCCN1/20IS5PCDCN **Max Marks: 100**
Course: Computer Networks-1

Instructions: 1. Answer any FIVE full questions, choosing one full question from each unit.
2. Missing data, if any, may be suitably assumed.

Important Note: Completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages. Revealing of identification, appeal to evaluator will be treated as malpractice.

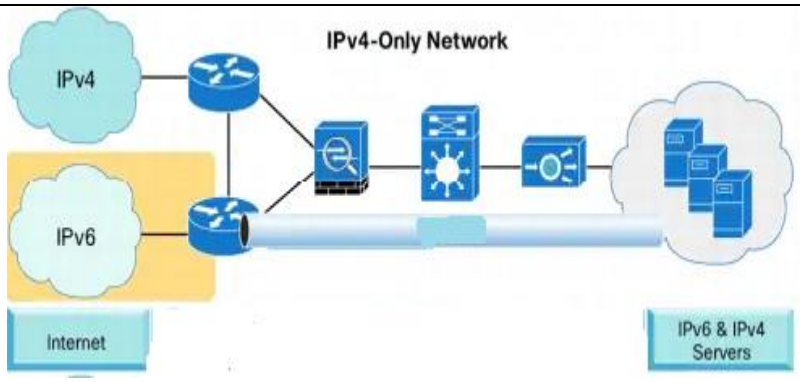
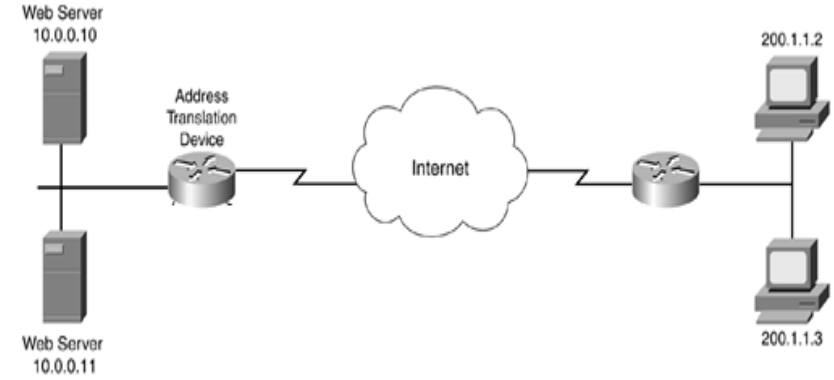
		UNIT - I	CO	PO	Marks
1	a)	Represent the appropriate layer of TCP/ IP model from Host1 to Host2 along with corresponding protocols considering the figure given below. Determine how many times each packet has to visit the network layer, data link layer and physical layer during a transmission from Host1 to Host2. 	CO3	PO2	8
	b)	For the bit stream 01001110, sketch the waveforms for each of the codes NRZ-I, Bipolar-AMI, Manchester, Differential Manchester. Assume that the signal level for the preceding bit for NRZ-I was high; the previous 1 bit (AMI) has a negative voltage.	CO2	PO1	8
	c)	What are the propagation time and the transmission time for a 2.5-KB (kilobyte) message if the bandwidth of the network is 2 Mbps? Assume that the distance between the sender and the receiver is 2,000 km and that light travels at 2.4×10^8 m/s.	CO2	PO1	4
		OR			
2	a)	A PCM encoder accepts a signal with a voltage signal with amplitudes Vmin = -10V and Vmax =+10V. Quantization levels=4 Given Sampled values are -6,7,10,6,2,-5,-9,-7,-3 i) Calculate zone width. ii) What is the quantization step size (range of each interval).	CO3	PO2	10

			iii) Calculate number of bits to encode. Provide calculation. iv) Find the total number of bits encoded and finally transmitted. v) Complete quantization and encoding steps to be demonstrated with diagram.			
		b)	Suppose two Ethernet LANs are interconnected by a box that operates as follows. The box has a table that tells it the physical addresses of the machines in each LAN. The box listens to frame transmissions on each LAN. If a frame is destined to a station at the other LAN, the box retransmits the frame onto the other LAN, otherwise the box does nothing. Is the resulting network still a LAN? Does it belong in the data link layer or the network layer? Can the approach be extended to connect more than two LANs? If so, what problems arise as the number of LANs becomes large?	*CO3*	*PO2*	**4**
		c)	Given a channel with a 1-GHz bandwidth. The SNR for this channel is 255.What are the appropriate bit rate and signal level?	*CO2*	*PO1*	**6**
			UNIT - II			
	3	a)	Given 12-bit code word 0x9DD in hexadecimal, extract the data bits, determine bit error if any, and if so, correct it. Representation of the data is from right to left and perform even parity.	*CO3*	*PO2*	**10**
		b)	Draw the sender and receiver windows for a system using Go-back-N ARQ, where a sender and receiver window size is 8-bit and can receive and send 3-bits and given the following: (a) Frame 0 is sent; Frame 0 is acknowledged. (b) Frames 1 and 2 are sent; Frames 1 and 2 are acknowledged. (c) Frames 3, 4, and 5 are sent; Frames 3 is lost; Timer expires (d) Frames 6, and 7 are sent; Cumulative acknowledgement is given Repeat the same scenario using Selective Repeat ARQ.	*CO3*	*PO2*	**10**
			OR			
	4	a)	For the given generator polynomial $g(x)= x^7+x^4+x^2$. Consider the information sequence $x^{10}+x^8+x^6+x^4+1$. Find the code word that will be transmitted corresponding to the given information sequence. i) Show the sender side calculation. ii) Show the receiver side calculation for best case iii) When the Receiver receives the left most bit as inverted. Show the calculations for the same.	*CO2*	*PO1*	**10**
		b)	The Following character encoding is used in a data link protocol: A: 01000111 B: 11100011 FLAG: 01111110 ESC: 11100000 Show the bit sequence transmitted in binary) for the four-character frame A B ESC FLAG e\when each of the following framing methods is used: a) Byte count b) Flag bytes with byte stuffing	*CO2*	*PO1*	**6**

			c) Starting and ending flag bytes with bit stuffing.			
		c)	Explain the services offered by data link layer with respect to connection oriented and connectionless service.	*CO1*		**4**
			UNIT - III			
	5	a)	A group of N stations share a 56-kbps pure ALOHA channels. Each station outputs a 1000-bit frame on average once every 100 sec, even if the previous one has not yet been sent. (e.g., the stations can buffer outgoing frames). What is the maximum value of N?	*CO3*	*PO2*	**6**
		b)	CSMA/CD (CSMA with Collision Detection) is widely used on LANs (Ethernet) in the MAC sub layer. Explain how it is implemented	*CO2*	*PO1*	**7**
		c)	Compare the two 802.11 architectures, along with its area of applications.	*CO2*	*PO1*	**7**
			OR			
	6	a)	Compare aloha and slotted aloha with diagram and throughput	*CO2*	*PO1*	**10**
		b)	Describe the assumptions for Dynamic Channel Allocation	*CO1*		**5**
		c)	Consider five wireless stations, A, B, C, D, and E. Station A can communicate with all other stations. B can communicate with A, C and E. C can communicate with A, B and D. D can communicate with A, C and E. E can communicate with A, D and B. (a) When A is sending to B, what other communications are possible? (b) When B is sending to A, what other communications are possible? (c) When B is sending to C, what other communications are possible?	*CO3*	*PO2*	**5**
			UNIT - IV			
	7	a)	Explain the process of fragmentation where a datagram payload of 1480 bytes sent over the network with MTU 500 bytes,	*CO3*	*PO2*	**6**
		b)	The organization is allotted with a network IP address 167.0.0.0/17 The organization decides to create subnetworks for 8 departments equally. Design the sub-networks. For each of these, give the network address, broadcast address, first IP address assigned, the last IP address assigned, and the mask in the w.x.y.z/s notation. Calculate the total number of IP addresses utilized.	*CO3*	*PO2*	**10**
		c)	A server has an IP address of 160.36.30.110, network mask of 255.255.254.0. Derive the broadcast address, network ID and the number of hosts that can be supported on this network. Show details.	*CO3*	*PO2*	**4**
			OR			
	8	a)	A large number of consecutive IP addresses are available starting at 172.16.0.0/16 Suppose that four organizations, A, B, C, and D, and	*CO3*	*PO2*	**10**

			E request 10000, 8000, 4000 and 2000 addresses, respectively, and in that order. For each of these, give the first IP address assigned, the last IP address assigned, and the subnet mask in the w.x.y.z/s notation. Calculate the total number of IP addresses not utilized.			
		b)	Consider the following routing table at an IP router. For each IP address in Group, Identify the correct choice of the next hop from Group II using the entries from the routing table above. **Group I** **Group II** i) 128.96.171.92 a) Interface 0 ii) 128.96.167.151 b) Interface 1 iii) 128.96.163.151 c) R2 iv) 128.96.165.121 d) R3 e) R4	***CO3***	***PO2***	**6**
		c)	An IPv4 packet has arrived with the first few hexadecimal digits as shown.0x45000028000100000102 . . . How many hops can this packet travel before being dropped? The data belong to what upper-layer protocol?	***CO3***	***PO2***	**4**
			UNIT - V			
	9	a)	Suppose a network uses link-state routing. Explain what happens if (a) The router fails to claim a link that is attached to it. (b) The router claims to have a link that does not exist.	***CO3***	***PO2***	**5**
		b)	Illustrate with message formats the different ICMP message types.	***CO1***		**10**
		c)	Design a solution for the given network. Explain how packet transmission happens between IPV6 and IPV4 servers to outside Internet in the given scenario.	***CO3***	***PO2***	**5**

Network No.	Net Mask	Next Hop
128.96.170.0	255.255.254.0	Interface 0
128.96.168.0	255.255.254.0	Interface 1
128.96.166.0	255.255.254.0	R2
128.96.164.0	255.255.252.0	R3
0.0.0.0	Default	R4

						
			OR			
	10	a)	Compare RIP and OSPF with respect to the following parameters convergence time and the number of messages exchanged under several trigger conditions, link failure, node failure, link coming up and TTL.	*CO2*	*PO1*	**7**
		b)	Illustrate Count to infinity problem in detail	*CO2*	*PO1*	**6**
		c)	For the given network apply Port Address translation. Design the network address translation table generated at Address translation device. (Port numbers can be assumed). Private IP address are 10.0.0.10 and 10.0.0.11 Public IP address are 200.1.1.2 ,200.1.1.3 and at Address translation device it is 192.1.1.5 	*CO3*	*PO2*	**7**

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