PES UNIVERSITY

PES University, Bengaluru

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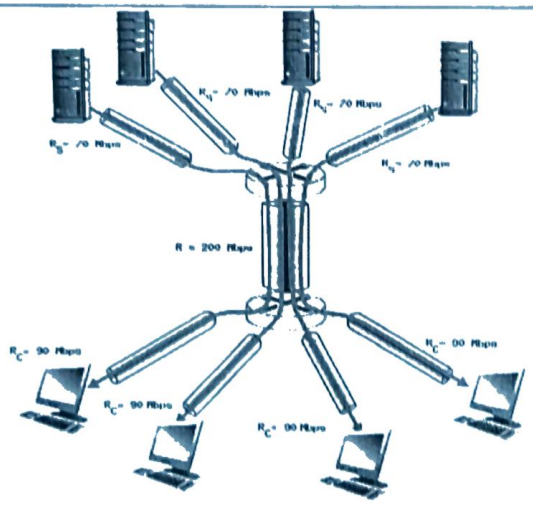
UE19/20CS253

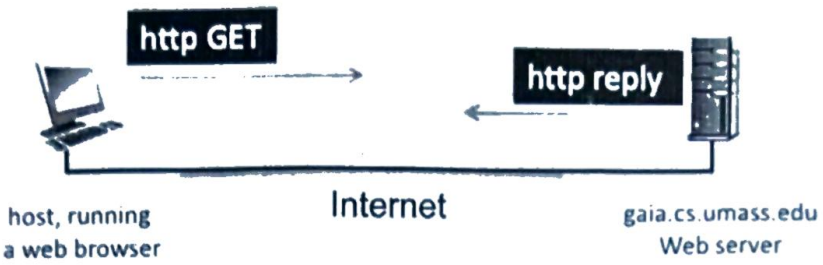
MAY 2022: END SEMESTER ASSESSMENT (ESA)
B.Tech (CSE) –IV SEMESTER

UE19/20CS253 – COMPUTER NETWORKS

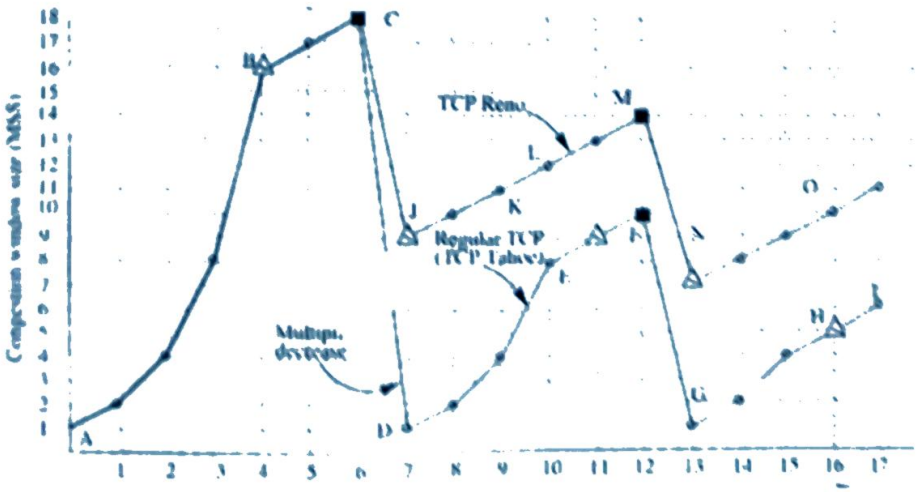
Time: 3 Hrs | Answer All Questions | Max Marks: 100

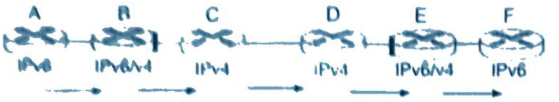
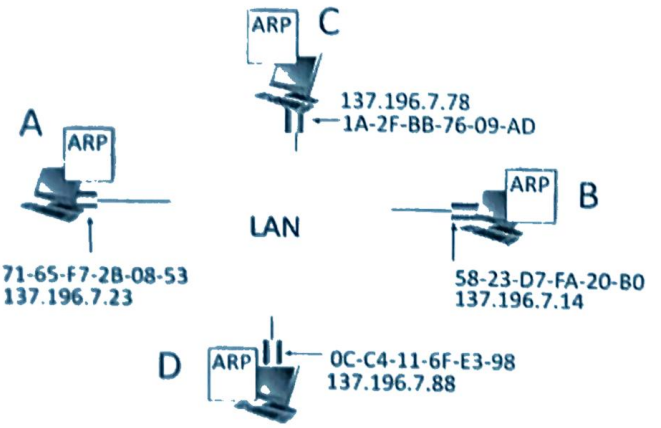
1.	a)	Alice and Bob are connected to each other via a router. The bandwidth of each link between the router and Bob is 20Mbps. If the network allows for the actual transmission of data at 20Mbps, then what is the time taken for a packet of size 1000 bits to enter the network?	4
	b)	Suppose two hosts, A and B, are separated by 5000 kilometers and are connected by a direct link of R = 4 Mbps. Suppose the propagation speed over the link is $2 * 10^8$ m/s. What is the maximum number of bits that the link can contain at any point of time during propagation?	4
	c)	Explain all the layers in the Internet Protocol Stack with a neat diagram.	6
	d)	 Consider the scenario shown above, with four different servers connected to four different clients over four three-hop paths. The four pairs share a common middle hop with a transmission capacity of R = 200 Mbps. The four links from the servers to the shared link have a transmission capacity of R_s = 70 Mbps. Each of the four links from the shared middle link to a client has a transmission capacity of R_c = 90 Mbps. a) What is the maximum achievable end-end throughput (in Mbps) for each of four client-to-server pairs, assuming that the middle link is fairly shared (divides its transmission rate equally)? b) Assuming that the servers are sending at the maximum rate possible, what is the link utilization for the shared link (R)?	6

	a)	Explain Connection Management in HTTP.	4
	b)	Explain the two types of DNS name resolution techniques with neat diagrams.	4

2.	c)	
		Consider the figure above, where the server is sending a HTTP RESPONSE message back to the client. Suppose the server-to-client HTTP RESPONSE message is the following:
		`HTTP/1.0 404 Not Found`
		`Date: Mon, 20 Jul 2020 16:24:09 +0000`
		`Server: Apache/2.2.3 (CentOS)`
		`Content-Length: 772`
		`Connection: Close`
		`Content-type: image/html`
		a) Is the response message using HTTP 1.0 or HTTP 1.1?
		b) Was the server able to send the document successfully? Yes or No
		c) How big is the document in bytes?
		d) Is the connection persistent or nonpersistent?
		e) What is the type of file being sent by the server in response?
		f) What is the name of the server and its version?
			6

	d)	Convert the UDP server program given below to a TCP server and also write the corresponding TCP Client for the same.
		`from socket import *`
		`serverPort = 12000`
		`serverSocket = socket(AF_INET, SOCK_DGRAM)`
		`serverSocket.bind(('127.0.0.1', serverPort))`
		`print ("The server is ready to receive")`
		`while True:`
		`  message, clientAddress = serverSocket.recvfrom(2048)`
		`  modifiedMessage = message.decode().upper()`
		`  serverSocket.sendto(modifiedMessage.encode(), clientAddress)`
			6

3.	a)	UDP is an unreliable protocol. But why does one such protocol exist? Justify your answer.	4
	b)	With a neat diagram, describe the steps involved in opening a TCP connection. Also justify why those steps are required.	4
	c)	Host A and B are communicating over a TCP connection, and Host B has already received from A all bytes up through byte 126. Suppose Host A then sends two segments to Host B back-to-back. The first and second segments contain 80 and 40 bytes of data, respectively. In the first segment, the sequence number is 127, the source port number is 302, and the destination port number is 80. Host B sends an acknowledgment whenever it receives a segment from Host A. 1. In the second segment sent from Host A to B, what are the sequence number, source port number, and destination port number? 2. If the first segment arrives before the second segment, in the acknowledgment of the first arriving segment, what is the acknowledgment number, the source port number, and the destination port number? 3. If the second segment arrives before the first segment, in the acknowledgment of the first arriving segment, what is the acknowledgment number? 4. Suppose the two segments sent by A arrive in order at B. The first acknowledgment is lost and the second acknowledgment arrives after the first timeout interval. Draw a timing diagram, showing these segments and all other segments and acknowledgments sent. (Assume there is no additional packet loss.) For each segment in your figure, provide the sequence number and the number of bytes of data; for each acknowledgment that you add, provide the acknowledgment number.	6
	d)	 Comment on the Congestion Avoidance phase and Slow Start Threshold with respect to both TCP Reno and TCP Tahoe. (X-Axis → Time)	6

4.	a)	Explain the different fields in IP header format with a neat diagram.	4
	b)	Explain the steps involved in a Laptop getting its Host Configuration from a DHCP server.	4
	c)	 Explain the IPv6 tunneling process with respect to the topology given above. Consider the source as A & destination as F. Depict how the source and the destination address change in the journey of every packet.	6
	d)	Assume a host with Ethernet address $(F4\text{-}B6\text{-}34\text{-}14\text{-}7A\text{-}C2)_{16}$ has joined the network. What would be its global unicast address if the global unicast prefix of the organization is 4B21:1317:3476 and the subnet identifier is B345? Explain.	6
5.	a)	Compute the CRC for the message sequence 1011010, if the generator polynomial is x^4+x+1. If the receiver receives 10110101110 will it accept ?	4
	b)	Differentiate between a Switch and a Router.	4
	c)	 With respect to the topology shown in the figure, If host A wants to send a datagram to host B. Explain how host A uses ARP protocol to determine the MAC address of host B. Also, draw the ARP Table of A.	6
	d)	Suppose you switch-on your laptop at the campus with WiFi SSIDs BEBLOC11 & BEBLOC10. Assuming your laptop gets connected to one of the SSIDs. Explain the two ways in which your laptop would have scanned for the WiFi SSIDs & Also, Explain how it gets associated with it.	6

**********ALL THE VERY BEST**********