OCTOBER 2020: IN SEMESTER ASSESSMENT
B Tech 5 SEMESTER

TEST – 1

UE18CS301 – COMPUTER NETWORKS

Time: 2 Hrs   Answer All Questions   Max Marks: 60

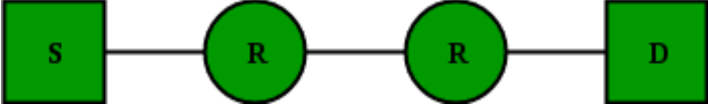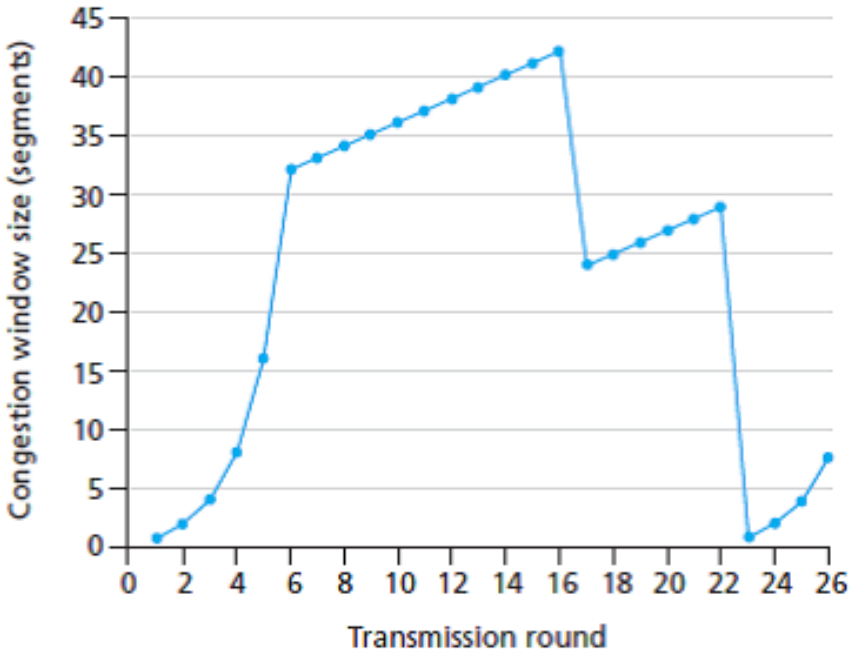|			

1.	a)	Consider the figure below, which draws the analogy between store-and-forward link transmission and propagation of bits in packet along a link, and cars in a caravan being serviced at a toll booth and then driving along a road to the next toll booth.
		
		Suppose the caravan has 10 cars, and that the toll booth services a car (that is, transmits) at a rate of one car per 5 seconds. Once receiving serving, a car proceeds to the next toll booth, which is 500 kilometers away at a rate of 20 kilometers per second. Also assume that whenever the first car of the caravan arrives at a toll booth, it must wait at the entrance to the toll booth until all of the other cars in its caravan have arrived, and lined up behind it before being serviced at the toll booth. (That is, the entire caravan must be stored at the toll booth before the first car in the caravan can pay its toll and begin driving towards the next toll booth).
		  1) Once the first car leaves the toll booth, how long does it take until it arrives at the next toll booth?
		  2) Once the last car leaves the toll booth, how long does it take until it arrives at the next toll booth?
		  3) Once the first car leaves the toll booth, how long does it take until it enters service at the next toll booth?
		  4) Are there ever two cars in service at the same time, one at the first toll booth and one at the second toll booth?
		  5) Are there ever zero cars in service at the same time, i.e., the caravan of cars has finished at the first toll booth but not yet arrived at the second toll booth?
			5

	b)	List six access technologies. Classify each one as home access, enterprise access, or wide-area wireless access.	3

	c)	Consider sending a packet from a source host to a destination host over a fixed route. List the delay components in the end-to-end delay. Which of these delays are constant and which are variable?	2
2.	a)	Suppose you would like to urgently deliver 40 terabytes data from Bangalore to Chennai. You have available a 100 Mbps dedicated link for data transfer. Would you prefer to transmit the data via this link or instead use BlueDart courier overnight delivery? Explain.	3
	b)	Suppose Host A wants to send a large file to Host B. The path from Host A to Host B has three links, of rates $R_1 = 500$ kbps, $R_2 = 2$ Mbps, and $R_3 = 1$ Mbps. 1. Assuming no other traffic in the network, what is the throughput for the file transfer? 2. Suppose the file is 4 million bytes. Dividing the file size by the throughput, roughly how long will it take to transfer the file to Host B? 3. Repeat (1) and (2), but now with R_2 reduced to 100 kbps.	5
	c)	Assume that source S and destination D are connected through two intermediate routers labelled R. Determine how many times each packet has to visit the network layer and the data link layer during a transmission from S to D. 	2
3.	a)	Assume that you have a base HTML file with 30 embedded images. These images and base file are small enough to fit in one TCP segment. How many RTT are required to retrieve base file & images under the following conditions: • Non-persistent connection with no parallel TCP connections • Persistent connection without pipelining • Persistent connection with pipelining (Assume RTT dominates all other time)	6
	b)	Suppose Bob joins a BitTorrent torrent, but he does not want to upload any data to any other peers (so called free-riding). Bob claims that he can receive a complete copy of the file that is shared by the swarm. Is Bob's claim possible? Why or why not?	2
	c)	List at least four different applications that are naturally suitable for P2P architectures.	2
4.	a)	Explain how HTTPS (SSL) works to keep your e-commerce transactions secure.	5
	b)	The transport layer protocols used for real time multimedia, file transfer, DNS and email, respectively are:	1

		Imagine that you are trying to visit www.enterprise.com, but you don't remember the IP address the web-server is running on.	
	c)	Assume the following records are on the TLD DNS server: • (www.enterprise.com, dns.enterprise.com, NS) • (dns.enterprise.com, 146.54.138.29, A) Assume the following records are on the enterprise.com DNS server: • (www.enterprise.com, east1.enterprise.com, CNAME) • (east1.enterprise.com, 142.81.17.206, A) • (www.enterprise.com, mail.enterprise.com, MX) • (mail.enterprise.com, 247.29.64.130, A) 1. How many types of Resource Records (RR) are there? 2. In the example given in the problem, what is the address of the DNS server for enterprise.com? 3. When you make the request for www.enterprise.com, your local DNS requests the IP on your behalf. When it contacts the TLD server, how many answers (RR) are returned? 4. Assume that the enterprise.com website is actually hosted on east1.enterprise.com, what type of record is needed for this?	4
5.	a)	When does a TCP sender perform a fast retransmission? Why?	3
	b)	Station A needs to send a message consisting of 11 packets to station B using a sliding window (window size 3) and Go-Back-N error control strategy. All packets are ready and immediately available for transmission. If every 6th packet that A transmits gets lost (but no ACKs from B ever get lost), then what is the number of packets that A will transmit for sending the message to B?	4
	c)	UDP and TCP use 1s complement for their checksums. Suppose you have the following three 8-bit bytes: 01010011, 01100110, 01110100. How does the receiver detect errors?	3

6)	a)	Consider figure showing TCP window size as a function of time. Assuming TCP Reno is the protocol experiencing the behavior shown below, answer the following questions. In all cases, you should provide a short discussion justifying your answer. 1) Identify the intervals of time when TCP slow start is operating. 2) Identify the intervals of time when TCP congestion avoidance is operating. 3) After the 16th transmission round, is segment loss detected by a triple duplicate ACK or by a timeout? 4) After the 22nd transmission round, is segment loss detected by a triple duplicate ACK or by a timeout? 5) Suppose TCP Tahoe is used (instead of TCP Reno), and assume that triple duplicate ACKs are received at the 16th round. What are the ssthresh and the congestion window size at the 19th round? 6) During what transmission round is the 70th segment sent?	6
	b)	Suppose Host A sends two TCP segments back to back to Host B over a TCP connection. The first segment has sequence number 90; the second has sequence number 110. 1) How much data is in the first segment? 2) Suppose that the first segment is lost but the second segment arrives at B. In the acknowledgment that Host B sends to Host A, what will be the acknowledgment number?	2
	c)	Suppose a process in Host C has a UDP socket with port number 6789. Suppose both Host A and Host B, each send a UDP segment to Host C with destination port number 6789. Will both of these segments be directed to the same socket at Host C? If so, how will the process at Host C know that these two segments originated from two different hosts?	2