PES University, Bengaluru
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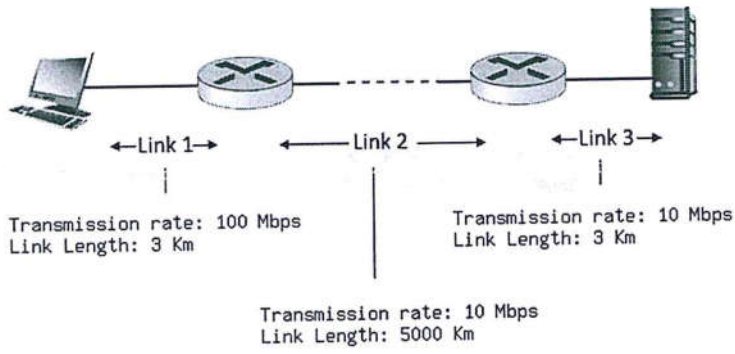
UE18CS301

DECEMBER 2020: END SEMESTER ASSESSMENT (ESA)
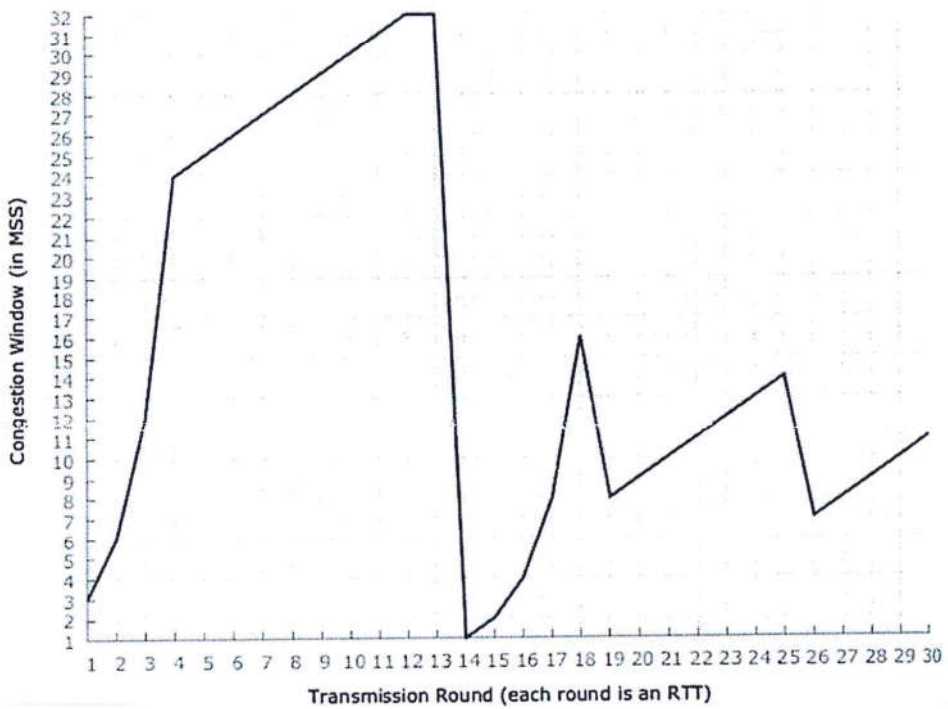### B.Tech (CSE) – V SEMESTER

UE18CS301 – COMPUTER NETWORKS

Time: 3 Hrs   Answer All Questions   Max Marks: 100

1.	a)	Round your answer to two decimals after leading zeros. i. How long does it take a packet of length 1000 bytes to propagate over a link of distance 2500km, propagation speed 2.5×10^8 m/s, and transmission rate 2 Mbps? ii. Consider the figure below, with three links, each with the specified transmission rate and link length. Assume the length of a packet is 16000 bits. The speed of light propagation delay on each link is 3×10^8 m/sec. Compute end-end delay. ←—Link 1—→ ←——— Link 2 ———→ ←—Link 3—→ Transmission rate: 100 Mbps / Link Length: 3 Km Transmission rate: 10 Mbps / Link Length: 3 Km Transmission rate: 10 Mbps / Link Length: 5000 Km	6
	b)	Refer to the exhibit below. Assume that Alice sends a packet to Bob via a switch and a router. With a neat diagram, illustrate the physical path taken by the packet down the Alice's protocol stack and taken up at the Bob's protocol stack (Hint: Encapsulation). Alice Switch Router Bob	10
	c)	Compare circuit and packet switching with any four important differences.	4
2.	a)	You are accessing www.cnn.com from your university network. Describe the process of obtaining the IP address for the hostname assuming that it is not cached at the local DNS server. Describe this for the recursive case with a neat diagram. Write a short note on various DNS resource records with an example for each.	6
	b)	Consider an e-commerce site (say, Amazon) that wants to keep a purchase record for each of its customers. Describe how this can be done with cookies with a neat diagram.	6

	c)	Alice @umn.edu plans to send an email to Bob @google.com. Please describe the sequence of actions of protocols to deliver this email to Bob's mailbox. Please also describe the actions for Bob to access this email. A neat diagram would suffice.	4
	d)	Assume there's an institutional cache (proxy) in the client's subnet. The client's initial request is cached by this cache. Since news pages change frequently the client wants to make sure that it does not get served an outdated HTML page from the cache. Explain the HTTP mechanism that prevents this from happening. What would be in the body of the second server reply if the reply would be 304 Not Modified?	4

3.

a)

Given the below Figure, that describes the evolution a TCP connection. Assuming that TCP-Reno is being used, please answer the following questions.

Transmission Round (each round is an RTT)

i. Specify all the intervals of transmission rounds during which AIMD is being used. (A fictional e.g., of answer, AIMD is used in the following intervals: 3-20, 45-50)

ii. Specify all the interval of transmission rounds during which SlowStart is being used.

iii. Identify transmission rounds where a loss is detected by triple duplicate ACKs.

iv. What is the initial value of ssthresh (ssthreshold)? Why?

v. Why doesn't slow start use Additive Increase?

vi. How many times does the value of ssthresh change? When do these changes occur? And what is the new value after each change? (Here's a fictional example of an answer, it changes once, at transmission round 45 it changes to 4.)

(marks: 7)

b) With a neat diagram, describe the four steps involved in TCP closing sequence. Also justify why those steps are required.

(marks: 6)

Consider the sliding window protocol in figure (a) & (b) below.

(a)   (b)

c)

i. What does these figures (a) & (b) indicate – Go-Back-N or Selective Repeat or no adequate information to tell? Explain your answer separately and briefly.

ii. Refer figure (b). Suppose the sender and receiver windows are of size N = 5 and suppose the sequence number space goes from 0 to 15. Show the position of the sender and receiver windows over this sequence number space at time t (the horizontal dashed line).

iii. Assume a TCP sender transmits 4 TCP segments with respective sequence numbers 1200, 2400, 3600, 4800, 6000. The sender receives four acknowledgements with the following sequence numbers, 2400, 2400, 2400, 2400, 7200. What could you infer from this?

7

4.

a) Suppose datagrams are limited to 1,500 bytes (including header) between source Host A and destination Host B. Assuming a 20-byte IP header, how many datagrams would be required to send an MP3 consisting of 5 million bytes? What is the size of last datagram? (Hint: MP3 file transfer uses RDT)

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b) The topology below shows a small network with 3 routers which connects client and server machines. Complete the static routing table entries for the Routers 1, 2 and 3 respectively so that packets will be delivered successfully.

With respect to above topology, answer the following.

i. When you ping from client to server, what will be the TTL value? Justify your answer.

ii. While pinging, disconnect the link between Router1 and Router2. What change you will observe now and why?

iii. On pinging from client to server, you receive a response "TTL expired in transit" error. Why?

10

	c)	Suppose an ISP owns a block of addresses of the form 128.119.40.64/26. Suppose it wants to create 4 subnets from this block, with each block having the same number of IP addresses. What are the prefixes (of form a.b.c.d/x) for the four subnets? How many addresses per subnet is possible (including network and broadcast addresses)? What do you mean by route summarization?	6

5.	a)	Consider hosts A, B, C, D, E, F, G and learning switches S1, S2, S3, S4, with their corresponding port numbers marked as shown. Assume the switches were just powered on so their forwarding tables are empty. Also assume that entries added to each forwarding table do not have a timeout.

i. Given that hosts send packets to each other in the following order, list all of the hosts and switches that receive each packet.
M1: Host A sends a packet to Host B
M2: Host A sends a packet to Host C
M3: Host E sends a packet to Host A
M4: Host C sends a packet to Host A
M5: Host B sends a packet to Host C
M6: Host G sends a packet to Host E

ii. Fill in the forwarding table for switch S2 as it will look after the above six packets have been sent (note: some entries may be unused).

iii. With this forwarding table, will switch S2 know the exact port to send a packet when it receives a packet from host A destined to any other host on the network? Justify your answer. | 10 |
| | b) | In this question, you will put together much of what you have learned about networking protocols. Suppose you walk into a Computer Science laboratory (say, B-205), connect your laptop to Ethernet, and want to access Edmodo website. What are all the protocol steps that take place, starting from powering on your PC to getting the web page? Assume there is nothing in our DNS or browser caches when you power on your PC. (Hint: the steps include the use of Ethernet, DHCP, ARP, DNS, TCP, and HTTP protocols.) Explicitly indicate in your steps how you obtain the IP and MAC addresses of a gateway router with a suitable diagram. | 10 |