National University of Computer and Emerging Sciences, Lahore Campus

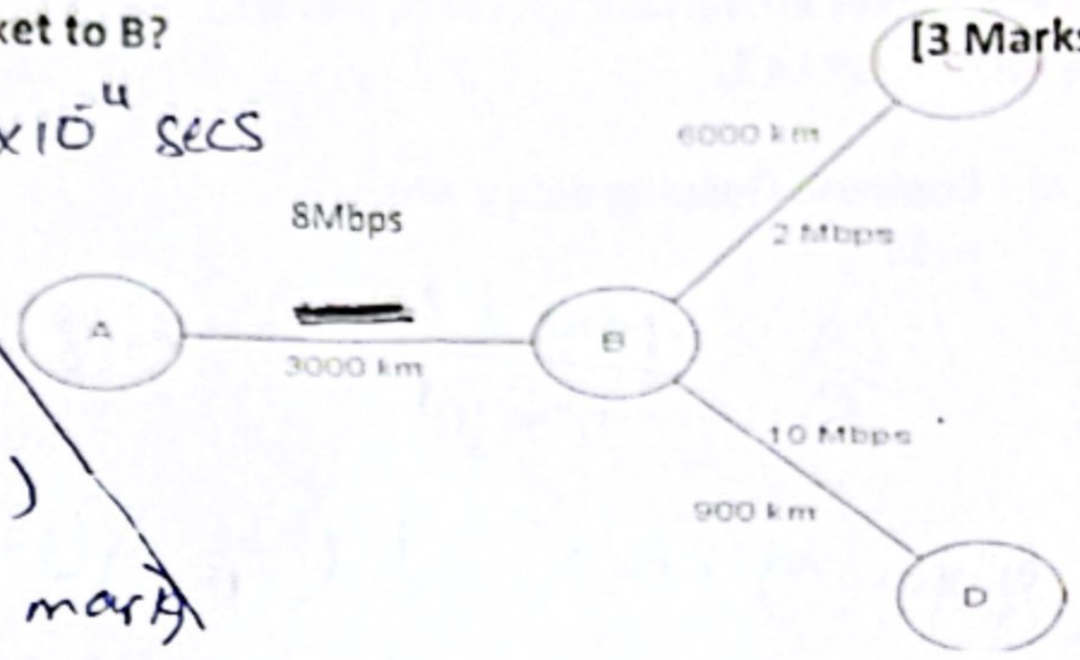
Course:	Computer Networks	Course Code:	CS3001
Program:	BS (Computer Science)	Semester:	Fall 2025
Due Date:	03rd Sep, 2025		
Section:	J	Roll No.	
Quiz #	1		

Q1: Figure illustrates the end-to-end transport of a message with and without message segmentation. Ignore propagation, queuing, and processing delays. **[10] [CLO 1]**

a) What is the transmission delay if A sends a 600 byte packet to B? **[3 Marks]**

Transmission delay $= \frac{L}{R} = \frac{600 \times 8}{8 \times 10^6} = 6 \times 10^{-4}$ secs

converting 600 bytes to bits (1 mark)
plugging values in $t = L/R$ (1 mark)
final answer with units (1 mark)



b) Now suppose that the message is segmented into 2 packets, with each packet being 300-byte long. A wants to send message to C through B. B is supposed to follow the store-and forward model, that is, B will receive the whole packet from A and then start transmitting the packet to C.

a) How long does it take to move the first packet from source host to the first switch? When the first packet is being sent from the first switch to the second switch, the second packet is being sent from the source host to the first switch. After how long is the 2nd packet received at the destination? [5 Marks]

1st packet from A to B $t = L/R = \frac{300 \times 8}{8 \times 10^6}$ (.5 mark) $= 3 \times 10^{-4}$ s (1 mark)

1st packet B to C $t = L/R = \frac{300 \times 8}{2 \times 10^6} = 1.2 \times 10^{-3}$ s (1 mark)

1st packet received at C $= 3 \times 10^{-4}$ s $+ 1.2 \times 10^{-3}$ s $= 1.5 \times 10^{-3}$ s (1 mark)

A finishes sending packet at $t = 3 \times 10^{-4} \times 2 = 6 \times 10^{-4}$ s (.5 mark)

B → C (2nd packet) $= 6 \times 10^{-4} + 1.2 \times 10^{-3} = 1.8 \times 10^{-3}$ s (1 mark)

b) What will be the throughput from A to D? **[2 Marks]**

Throughput = min {A-B, B-D} = {8 Mbps, 10 Mbps} = A-B 8 Mbps

Q2: Assume a constant transmission rate of R = 10 x 10^5 bps, a constant packet-length L = 6100 bits, a is the average packet arrival rate (packets/second.) Traffic intensity I = La/R, the queuing delay is calculated as I*(L/R)(1 - I) for I < 1. **[10] [CLO 1]**

a) **Compute Queuing delay when:** **[3+3 Marks]**

a=30

$I = \frac{La}{R} = \frac{6100 \times 30}{10 \times 10^5} = 0.183$ (1 mark)

Queuing delay $= I^*\left(\frac{L}{R}\right)(1-I)$

$= 0.183\left(\frac{6100}{10 \times 10^5}\right)(1-0.183)$ (1 mark)

$= 9.12 \times 10^{-4}$ ms (1 mark)

a=91

$I = \frac{La}{R} = \frac{6100 \times 91}{10 \times 10^5} = 0.5551$ (1 mark)

Queuing delay $= I\left(\frac{L}{R}\right)(1-I)$

$= 0.5551\left(\frac{6100}{10 \times 10^5}\right)(1-0.5551)$ (1 mark)

$= 1.51 \times 10^{-3}$ ms (1 mark)

b) **Assuming the router's buffer is infinite, the queuing delay is 1.5387 milliseconds, and 1501 packets arrive. How many packets will be in the buffer 1 second later?** **[4 Marks]**

Packets left in buffer = $1501 - \text{floor}\left(\frac{1}{1.5387 \times 10^{-3}}\right)$ (2 marks)

$= 1501 - 649$ (1 mark for 649)

$= 852$ packets