# National University of Computer and Emerging Sciences, Lahore Campus

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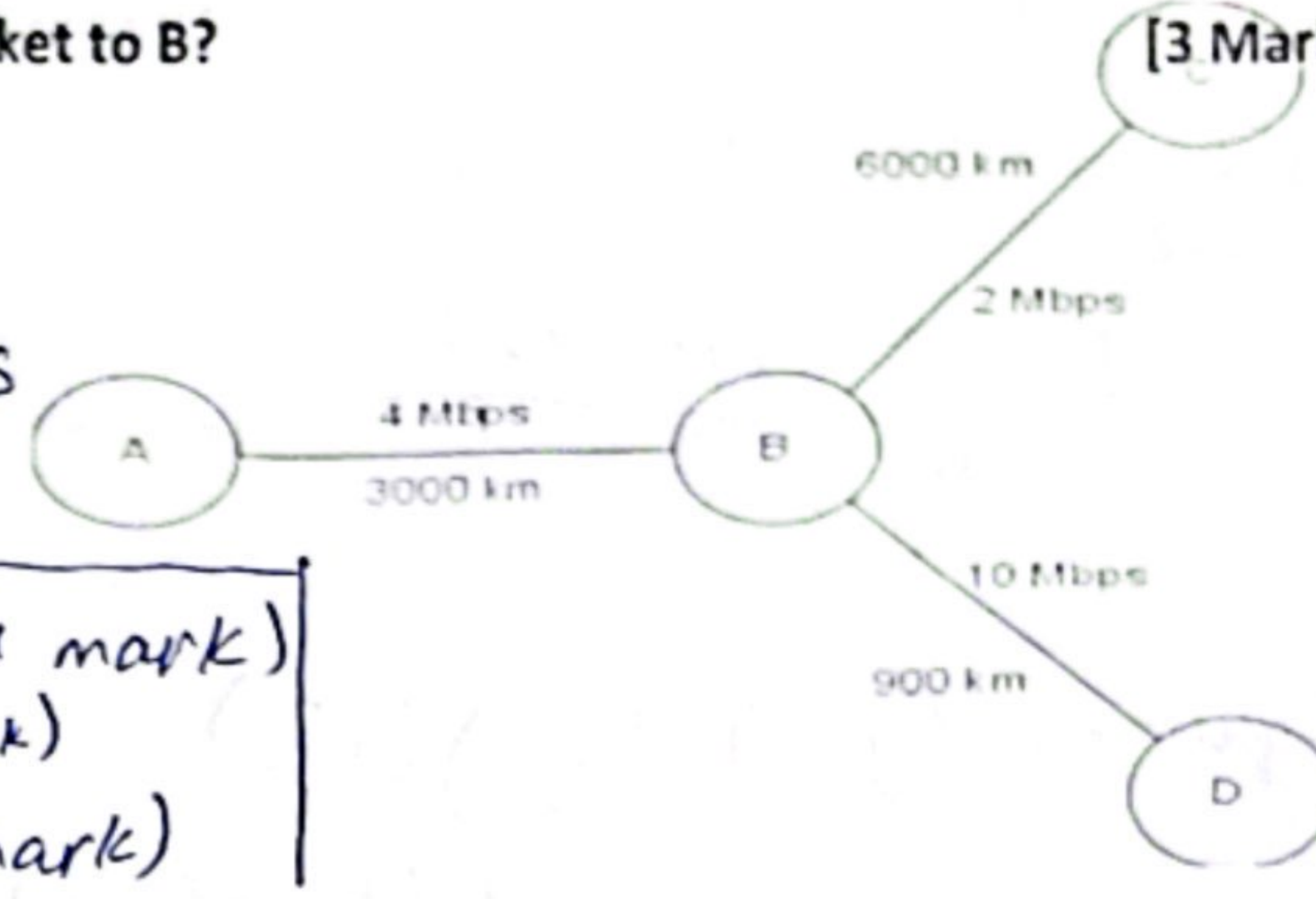
| | Course: | Computer Networks | Course Code: | CS3001 |
| | Program: | BS (Computer Science) | Semester: | Fall 2025 |
| | Due Date: | 03" Sep, 2025 | | |
| | Section: | J | Roll No. | |
| | Quiz # | 1 | | |

**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 500 byte packet to B?** **[3 Marks]**

Transmission delay $= \frac{L}{R}$

$= \frac{500 \times 8}{4 \times 10^6} = 0.001s = 1ms$




converting 500 bytes to 4000 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 250-byte long. A wants to send message to D 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 D.**

**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 Source Host to 1st switch

$t = L/R = \frac{250 \times 8}{4 \times 10^6}$ (.5 mark) $= 0.0005s = 0.5ms$ (1 mark)

1st packet ~~received at~~ $B \to D$

$t = L/R = \frac{250 \times 8}{10 \times 10^6} = 0.0002s = 0.2ms$ (1 mark)

1st packet received at D $= 0.5 + 0.2 = 0.7$ ms (1 mark)

A finishes sending packet at $t = 0.5 + 0.5 = 1.0$ ms (.5 mark)
$B \to D$ (2nd packet) $= 1.0 + 0.2 = 1.2$ ms. (1 mark)

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

Throughput = min {A - B, B - C} = min{4Mbps, 2Mbps} = 2 Mbps



0.5 mark for ~~identifying~~ mentioning correct link

Q2: Assume a constant transmission rate of R = 13 x $10^5$ bps, a constant packet-length L = 5100 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=22

$I = \frac{La}{R} = \frac{5100 \times 22}{13 \times 10^5} = 0.086$ ( 1 mark )

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

$= 0.086(5100/13\times10^5)(1-0.086)$ (1 mark)

$= 0.306$ ms (1 mark)

a=89

$I = \frac{La}{R} = \frac{5100 \times 89}{13 \times 10^5} = 0.349$ (1 mark)

Queuing delay $= I^*(L/R)(1-I)$

$= 0.349\left(\frac{5100}{13\times10^5}\right)(1-0.349)$ (1 mark)

$= 0.886$ ms (1 mark)

b) Assuming the router's buffer is infinite, the queuing delay is 1.9538 milliseconds, and 1602 packets arrive. How many packets will be in the buffer 1 second later? [4 Marks]

Packets left in buffer $= 1602 - \text{floor}\left(\frac{1}{1.9538\times10^{-3}\,s}\right)$ (2 mark

$= 1602 - 511$ (1 mark for 511)

$= 1091$ packets. (1 mark)