CSC 458/2209 (Section L0101d): Computer Networks, Fall 2025

Department of Computer Science, University of Toronto

Quiz # 1 – 15 minutes	**Date:** Tuesday, October 7th, 2025
Name:	**Student ID #:**

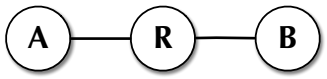
Instructions:

(i) This quiz has 3 problems (9 parts), and a total of 18 points.

(ii) Please be clear and concise in your answers. Explain in your reasoning if needed. If the final answer is wrong, but your reasoning is correct you are going to receive partial credit.

1. Fragmentation. Hosts **A** and **B** are connected through an intermediate routers **R**. The maximum transmission unit (MTU) for the link are:

- **A → R**: 1000 bytes
- **R → B**: 500 bytes



The IP **header size is 20 bytes**; link layer and transport layer headers are ignored. We also assume fragments can be of any size, i.e., they do not need to be a multiple of 8 bytes.

1a) [2 points] What is the largest amount of **data** (in bytes) in an IP datagram sent from **A** to **R**?

980 Bytes

1b) [2 points] If we sent a packet of size 1000 bytes (including header) from **A** to **B**, how many fragments are generated at **R**?

3 Fragments

1c) [2 points] What is the amount of data in each fragment generated at **R**?

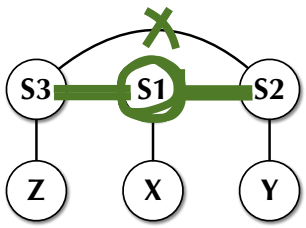
480B + 480B + 20B

1d) [2 points] Let us assume we can change the MTU for the link **R→B**. What is the smallest value of MTU that ensures each packet coming from **A** to **R** is fragmented into a maximum of two new packets?

510 B (490 B payload + 20 B header)

Name:

2. Learning Switches. Consider three hosts **X**, **Y**, and **Z** connected by a network of switches named **S1** to **S3** as shown in the figure below. Here, the IDs of switches **S1** to **S3** are **1** to **3**, respectively. All links have equal cost (cost = 1). We run the spanning tree protocol in this network to make sure there are no loops in the network.



2a) [2 points] Which switch is the root? Which link(s) is/are discarded?

2b) [2 points] Host **Z** sends a single packet to host **X**. Which switches does this packet go through to reach its destination (list all the switches along the path).

S3 - S1 (also broadcast to S2 if tables are initially empty)

2c) [2 points] We assume all forwarding tables are initially empty. Host **Z** sends a packet to host **X**, and then Host **Y** sends a packet to Host **X**. Give the forwarding table for switch **S1**.

Destination	Next Hop
Y	S2
Z	S3

3. Longest Matching Prefix. A router **R** has a forwarding table shown below. For any incoming packet with a destination IP address **Dest**, the router checks which entries match **Dest** and chooses the longest (most specific) matching prefix to decide the next hop.

Prefix	Next Hop
1.2.3/24	**A**
1.2/16	**B**
1.2.0/17	**C**
*	**D** (Default)

The last row is a catch all entry, i.e., if matches every packet that does not match the rows before. For each packet with destination addresses below, identify which outgoing port (**A**, **B**, **C**, or **D**) is chosen by router **R**:

3a) [2 points] Destination = 1.2.4.5 → **C (also matches B, but C is a longer match)**

3b) [2 points] Destination = 1.2.3.4 → **A**