# United International University (UIU)

*Dept. of Computer Science and Engineering (CSE)*

**Final Exam** Year: **2025** Trimester: **Spring**

Course: **CSE 323/3711** Title: **Computer Networks**

Marks: **40** Time: **2 Hours**

**[Any examinee found adopting unfair means will be expelled from the trimester/program as per UIU disciplinary rules.]**

There are **4 (four)** questions. Answer **all** of them. All questions are of values indicated on the right-hand margin.

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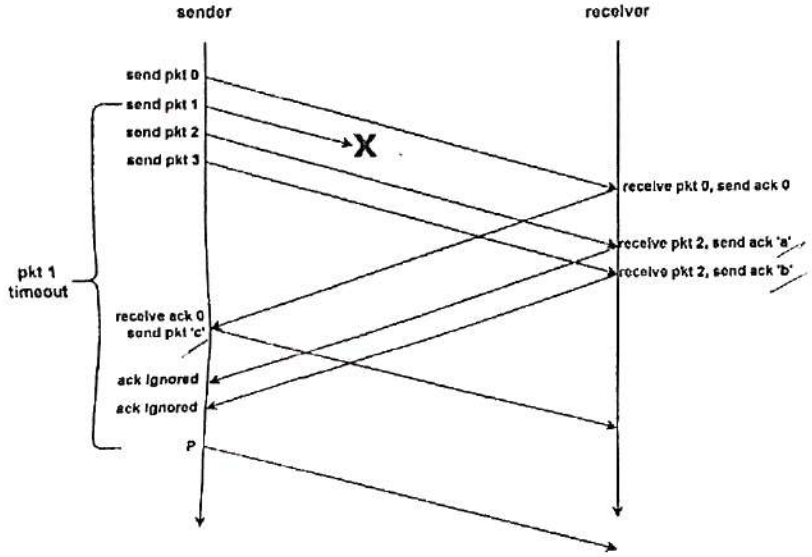
**Q1.** a) **Host A**, with **IP address 192.168.1.2** and **source port 5000**, sends an **HTTP request** to **Host B**, which has **IP address 192.168.1.10** and is running a web server listening on **port 80**. **Describe** how **multiplexing** and **demultiplexing** occur at the Transport layer. **[ 3 ]**

b) **Explain** the difference between **TCP** and **UDP** with **example scenarios** best suited for each of the protocols. **[ 2 ]**

c) Consider the **following scenario**, where the sender is scheduled to **send 10 packets** (Packets 0-9): **[ 2 + 1.5 + 1.5 = 5 ]**




i) **Find** the values of a, b and c.

ii) After the **timeout**, what will be the **next sequence of packets** to be sent for **Go-Back-N** protocol?

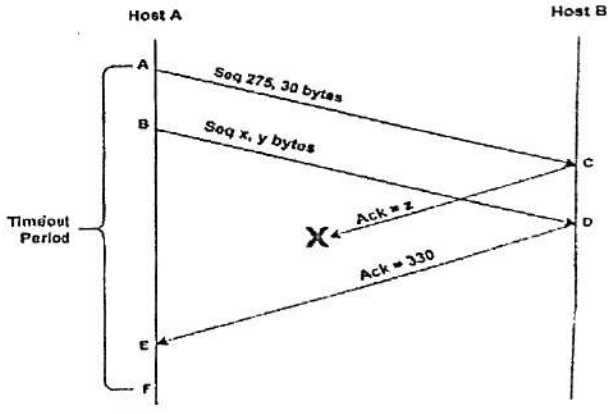
iii) After timeout, what will be the next **4 sequence of packets** to be sent for **Selective Repeat** protocol?

**Q2.** a) Consider the following **TCP data transfer** diagram: **[ 2 + 1.5 + 1.5 = 5 ]**

i) **Find** the values of **x, y, z.**

ii) Suppose, **Host A** still needs to send **50 bytes** of data; **explain** at **which point (E or F)** it will send the data. What will be the **sequence number** from that point?

iii) **Explain** what happens when the **Ack 330** arrives after the Timeout Period (with **necessary updates** to the diagram). What will be the **sequence number** of the next sent data?




b) Suppose that **two hosts** communicate over a **TCP connection**. **Explain** what happens if **network layer** delivers data **faster** than **application layer** removes data from **socket buffers?** **[ 2 ]**

c) Suppose that you are a **newly connected host** in a certain LAN and the **IP address** of the **DHCP server** is **143.161.10.31**. **Explain** the **4 (four) steps** of the DHCP process for allocating IP address for your host with a **diagram**. **[ 3 ]**

Q3. a) Your host machine, which is behind a NAT router, is running CSGO game on host port # 3301 and FaceTime video chat on port # 3302 with a private IP address 10.0.0.1. The public IP address of the NAT router is 138.76.29.7 that uses port numbers in [5001, 5999] for the NAT mechanism. Your friend Arthur's host machine (with private IP address 10.0.0.2), behind a different NAT router, is just running FaceTime on port # 4501. The public IP address of this NAT router is 137.91.12.44 that uses port numbers from [7001, 7999] for the NAT mechanism. You and Arthur are communicating via FaceTime. You are sending a packet (denoted by PKT) to Arthur. Now, use the following diagram addressing the following 2 queries: [4]


- How will your NAT router modify the PKT?
- How will Arthur's NAT router interpret and modify, and ultimately, will his host is going to see it?

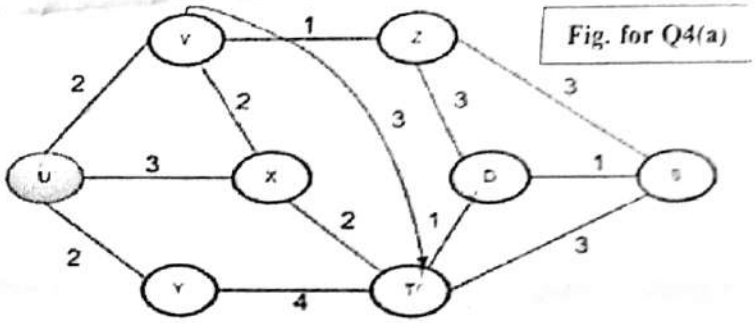
Show the ordered steps and source IP, source port, destination IP, and destination port for the packet for each of these steps.

b) An IP router with a Maximum Transmission Unit (MTU) of 1500 bytes has received an IP packet of size 4480 bytes with an IP header of length 20 bytes. How will this packet be fragmented? Show each of the fragmented packets' length, fragflag, and offset fields. [4]

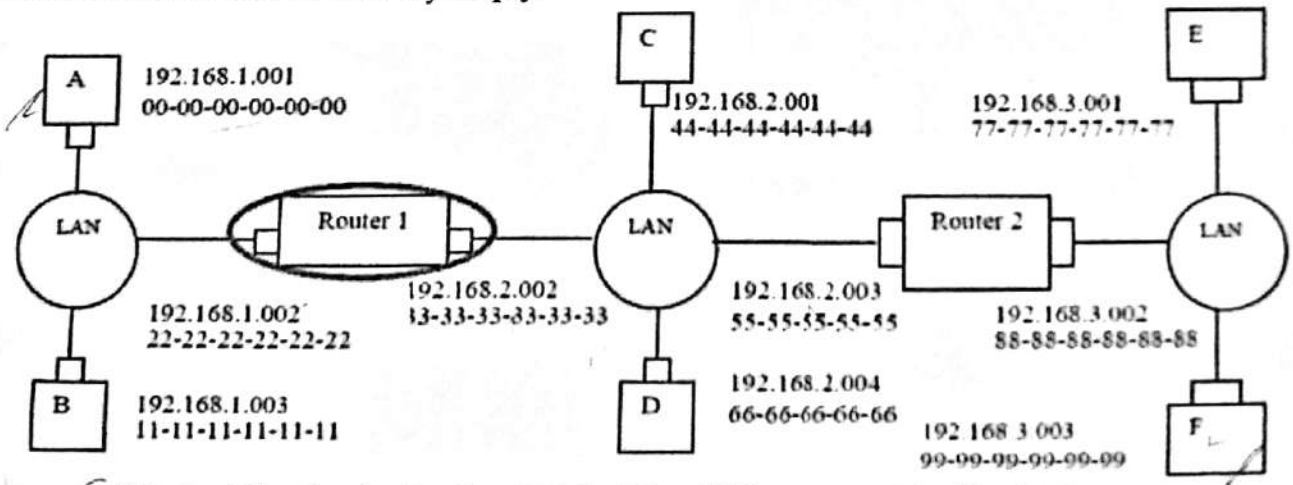
c) What advantages does IPv6 have over IPv4? Write the following IPv6 in compressed format. [2]

2001:0db8:0000:1111:0000:0000:0000:0200

Q4. a) Given graph G = (N, E) on the right, where N is the set of routers and E is the set of links. Using Dijkstra's link-state routing algorithm, compute the least cost path from node U to all other nodes and show the resulting forwarding table for U, or the least-cost-path tree from U. [5]




b) Suppose, Host A in the following network would like to send an IP datagram to Host F, and assume that A's ARP table is initially empty.




i. What will be the destination MAC of the ARP query sent by Host A? [1]

ii. Which nodes in the network will receive the ARP query from Host A? [1]

iii. Which IP address will respond to the ARP query sent by Host A? [1]

iv. In the Ethernet Data frame (containing the IP datagram destined to F) that is delivered to Router 1, what are the source and destination IP and MAC addresses? [2]