United International **University** (**UIU**)
Dept. of Computer Science and Engineering (CSE)
Final Assignment   Year: **2020**   Semester: **Spring**
Course: **CSE 323** Title: **Computer Networks (Section – A/B/C)**

Answer <u>all 4</u> **(Four)** questions. Figures in the right-hand margin indicate full marks.

Q.1 a) **Host A** and **B** are communicating over a TCP connection, and **Host B** has already received from **Host A** all bytes up to **byte** # **350**. Suppose **Host A** then sends **two segments** to **Host B** back-to-back. The first and second segments contain **150** and **100 bytes of data**, respectively. In the **first segment**, the **sequence number** is **351**, the **source port number** is **5000**, and the **destination port number** is **25**. **Host B** sends an acknowledgement whenever it receives a segment from **Host A**.

i. For the **second segment** sent from Host A to B, what are the **sequence number, source port number,** and **destination port number**? **[1]**

ii. If the **second segment** arrives before the **first segment**, in the acknowledgment of the first arriving segment, what is the **acknowledgment number, source port number,** and **destination port number**? **[1]**

iii. Suppose the **two segments** sent by A arrive in order at B. The **first acknowledgement is lost** and the second acknowledgement arrives **before** the first timeout interval. **Draw a timing diagram**. Describe **what will happen** after the **first timeout interval**? **[2]**

iv. Suppose, **two segments** have been successfully received at B and in the **acknowledgment of the second segment** the **free space(receive window)** advertised by B was **987**. Considering the **entire buffer length** of B as **1236 bytes**, **how many bytes** of data has B been able to read and pass to application layer throgh socket at the moment of sending the second acknowledgment and <u>**why**</u>? **[2]**

Q.2 a) Given the following **routing table,** compute the **next hop** for each of the incoming packets (i to iv, <u>**show calculations**</u>): **[4]**

Destination	netmask	next hop
128.96.39.0	255.255.255.128	port0
128.96.39.128	255.255.255.128	port1
128.96.40.0	255.255.255.128	R2
192.4.153.0	255.255.255.192	R3
default		R4

i. **128.96.39.10**   ii. **128.96.40.12**   iii. **128.96.40.151**   iv. **192.4.153.90**

b) **Selim** and **Ahmed** are two students of UIU. Both **Selim** and **Ahmed** are at home behind their NAT routers, **A** and **B** respectively. **Selim**'s IP address is **192.168.10.2** and **Ahmed**'s IP address is **172.30.108.19**. **Router A** is using public IP **200.165.55.66** and port numbers from **5555 to 6666** for NAT. **Router B** is using public IP **211.99.88.101** and port numbers **7777 to 8888** for NAT. Also, assume that **Gmail Server's** IP address is **88.76.54.32** and **Google Server**'s IP address is **128.83.83.20**.

i. Suppose, **Selim** is accessing **Gmail Server** from his PC using client **port** # **6700**. What will be the **source** & **destination IP address** and **port numbers** in the packet arriving at the **router A** from **Gmail Server**. **[2]**

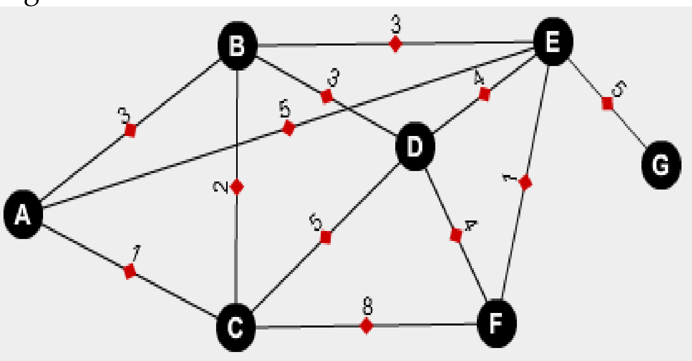
ii. Now, suppose both **Selim** and **Ahmed** are **checking E-mail** (using server port # 25 and client port # 6700) and **searching some materials in google** (using server port # 80 and client port # 8900) simultaneously. Show the **corresponding entries** in **NAT table** for both router A & B. **[3]**

WAN Side (IP address, Port #)	LAN Side (IP address, Port #)

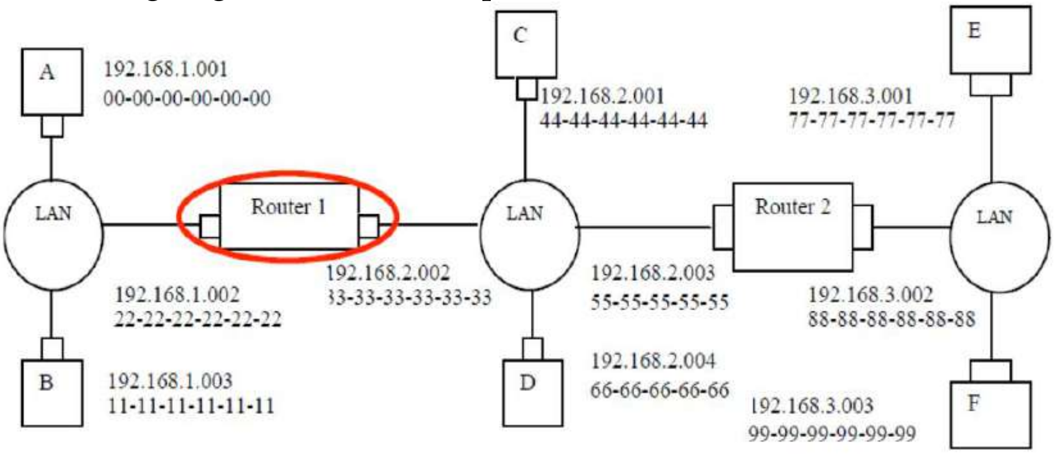
Q.3 a) Why **Fragmentation** is necessary? How it is different than **Segmentation** in **Transport layer**. Suppose that a **source S** sends a message of length **6000 bytes** via network A to a **destination D**. Network A has an

MTU of 1500 bytes. Show how the datagram will be **fragmented.**The IP header is assumed to be **20 bytes.** (**Hint:** Show values of the fields: ID, fragFlag and Offset). **[1+1+3 = 5]**

b) Consider the network shown in the following diagram. Use **Dijkstra's link-state algorithm** to compute the **forwarding table** for **C**. To get credit for this question, you should **<u>show all calculations</u>** of the algorithm. **[6]**



Q.4 Consider the following diagram to answer the questions.



a) Suppose **Host D** would like to send an IP datagram to **Host B**, and assume that **D's ARP cache does not contain B's MAC address**.

i. Will **Host D** perform an **ARP query** to find **Host B's MAC address**? **Why**? **[2]**

ii. What will be the **destination MAC address** in the **ARP query** by **Host D**? **[1]**

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

b) Suppose **Host E** would like to send an IP datagram to **Host F**, and **ARP tables are already filled up** (each node knows others' MAC address). Further suppose that the forwarding table/MAC table of switch connecting **E** and **F** (Assume **S1**) is **empty** and **Host E** & **Host F** are connected to **ports 2 & 3** of **Switch S1**, respectively. Fill up the following table for the given actions: **[2]**

Action	Switch table state	Link(s) packet is forwarded to	Explanation
Host E sends a frame to Host F			
Host F replies to Host E			

c) Consider sending a data packet from **E** to **A.** Assume **ARP table of all the nodes** in the network is **empty**. <u>List</u> the **source and destination IP and MAC address** of every **ARP Request** and **ARP Reply** that is needed to send the **data packet** successfully from **E** to **A**. **[2]**

End of the Paper