



SCHOOL OF COMPUTING AND ENGINEERING SCIENCES (SCES)  
MASTER OF SCIENCE IN COMPUTING AND INFORMATION SYSTEMS  
END OF SEMESTER EXAMINATION  
MST 8101: NETWORKING AND COMMUNICATIONS

**DATE: 27<sup>th</sup> April 2026**

**Time: 18:00-20:30 Hours**

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**Instructions: Answer Question One and any Two other Questions**

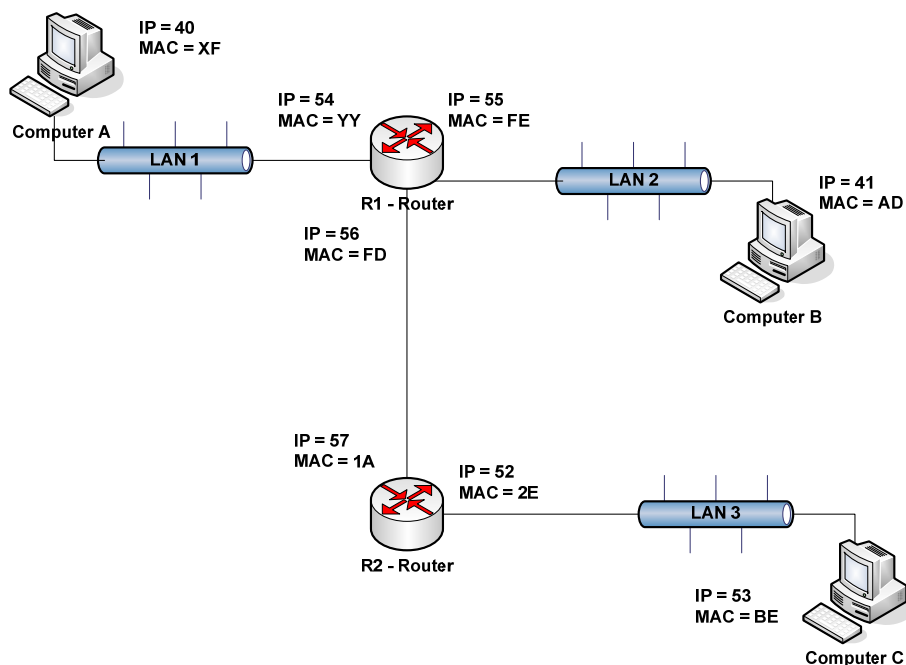
**QUESTION 1**

- Consider a scenario where two email servers (A and B) exchange emails. Using a diagram, explain how messages are processed (encapsulation on the sending server, de-capsulation on the receiving server), with details of protocols that are used at each layer of the TCP/IP reference model. **[7 Marks]**
- Give names of network applications that use the following port numbers; 23, 25, 53, 67, 80, 443 **[3 Marks]**
- List and explain the use of three subscriber identifiers that are used in Global System for Mobile (GSM) networks. **[6 Marks]**
- Using a diagram, explain how Address Resolution Protocol (ARP) is used in an Ethernet computer network **[4 Marks]**

**(Total 20 Marks)**

**QUESTION 2**

- Explain the logic used by a computer on a LAN to decide if a destination computer of some packets resides on the same subnet as itself or on a different subnet. **[2 Marks]**
- In the diagram Fig. 1, if computer A sends a packet to computer B and another packet to computer C. Trace the Ethernet frames, showing the contents (**src** and **dst** IP and MAC addresses) as they move from A-to-B, A-to-C and replies from both computers.



[5 Marks]

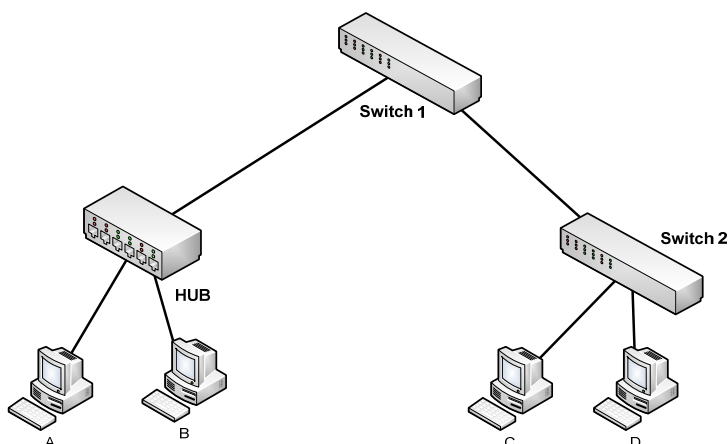
- c. Using diagrams and tables discuss the operation of NAT in the following scenario: An internal network using the address 10.10.1.0 and subnet mask 255.255.255.0 and connecting to an external network using a gateway with public address 195.67.56.5. Illustrate processing of outgoing and incoming connections. [4 Marks]

- d. List and explain 4 types of delay in packet switched networks. [4 Marks]

(Total 15 Marks)

### QUESTION 3

- a. Explain how the following media access control mechanisms operate: TDMA, FDMA, CDMA, CSMA-CD. [5 Marks]
- b. Use a switch learning table to explain the processing of Ethernet frames for the network given below [6 Marks].



- c. Use a diagram to explain the GSM short message service (SMS) architecture and an explanation of how SMS is transported. *Hint: Show all GSM network components that are involved in SMS transport.* [4 Marks]

**(Total 15 Marks)**

#### **QUESTION 4**

- a. Draw an architectural diagram of a GSM and 3G network, and name and state the function of all major components of the network [10 Marks].
- b. Using a diagram of GSM network components, illustrate the sequence of events that happen when a mobile phone experiences low signal power from a BTS and hands over to the next base station. [5 Marks]

**(Total 15 Marks)**