STRATHMORE UNIVERSITY
SCHOOL OF COMPUTING AND ENGINEERING SCIENCES
MASTER OF SCIENCE IN INFORMATION SYSTEMS SECURITY
END OF SEMESTER EXAMINATION
MST 8101
NETWORKING AND COMMUNICATIONS

DATE: 16th December, 2024 **Time: 18:00-20:30 Hours**

Instructions: Answer Question <u>One</u> and any <u>Two</u> other Questions

QUESTION 1 [20 Marks]

a. The figure in Fig. Q1a shows a network with two routers and the following links A - R1, R1 – B, R1 – R2, R2 – C. The network is used to send IP packets inside Ethernet frames. The IP addresses and MAC addresses for each node interface are abbreviated as shown.

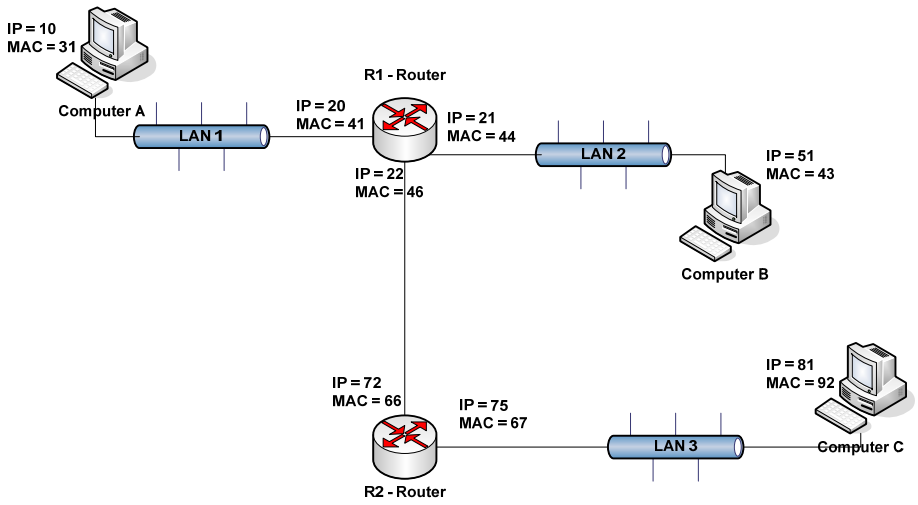

Fig. Q1a

i. Label source and destination IP addresses and MAC addresses on each link when a packet is sent from computer A to computer C **[3 Marks]**

ii. Label IP addresses and MAC addresses on each link when a packet is sent from computer B to computer C **[3 Marks]**

b. Hyper Text Transfer Protocol (HTTP) is a common protocol that is used for Internet communications. With respect to the TCP/IP reference model, use a diagram to illustrate how a message sent using HTTP is encapsulated and decapsulated at each layer on the sending side and receiving side while being sent from an application on one computer to an application on another computer. **[10 Marks]**

c. List and explain the use of four subscriber identifiers that are used in Global System for Mobile (GSM) networks. **[4 Marks]**

QUESTION 2 [15 Marks]

a. Draw an architectural diagram of a 2G GSM network, and name and state the function of all major components of the network [**9 Marks**].

b. Use an illustrative diagram of a GSM network with key components only explain the routing of an incoming GSM call that originated from a PSTN network. [**6 Marks**]

QUESTION 3 [15 Marks]

a. Create and fill switch tables and explain how switch learning and selective forwarding of frames is used to process Ethernet frames for the network in Fig. Q3a.

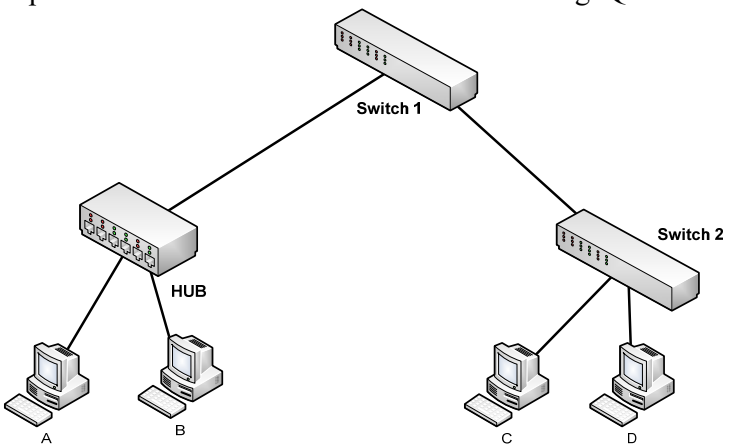

Fig. Q3a [**5 Marks**]

b. Using a diagram, explain how Address Resolution Protocol (ARP) is used in an Ethernet computer network. [**5 Marks**]

c. Using a diagram illustrate the functional architecture of Simple Network Management Protocol (SNMP). [**5 Marks**]

QUESTION 4 [15 Marks]

a. With reference to the structure of an IP header illustrate how IP fragmentation is used and explain how an attacker can launch tiny fragment attacks. [**7 Marks**]

b. Use a diagram to illustrate how WLAN networks use Carrier Sense Multiple Access with collision avoidance. [**8 Marks**]