UTHM
Universiti Tun Hussein Onn Malaysia

UNIVERSITI TUN HUSSEIN ONN MALAYSIA

FINAL EXAMINATION
SEMESTER II
SESSION 2023/2024

COURSE NAME	:	COMPUTER NETWORKS
COURSE CODE	:	BEJ42103
PROGRAMME CODE	:	BEJ
EXAMINATION DATE	:	JULY 2024
DURATION	:	3 HOURS
INSTRUCTION	:	1. ANSWER ALL QUESTIONS.

2. THIS FINAL EXAMINATION IS A CONDUCTED VIA
   ☐ Open book
   ☒ Closed booked

3. STUDENTS ARE **PROHIBITED** TO CONSULT THEIR OWN MATERIAL OR ANY EXTERNAL RESOURCES DURING THE EXAMINATION CONDUCTED VIA CLOSED BOOK.

THIS QUESTION PAPER CONSISTS OF **FIVE(5)** PAGES

Q1 (a) (i) What are the **THREE(3)** approaches that can be taken to avoid having a single wireless link degrade the performance of an end-to-end transport-layer TCP connection?

(3 marks)

(ii) Assume you have the following **TWO(2)** bytes: 11011010 and 01101101. Calculate the checksum of these **TWO(2)** bytes.

(4 marks)

(iii) Justify why an application developer might choose to run an application over UDP rather than TCP.

(6 marks)

(b) In modern packet-switched networks, including the Internet, application-layer messages will be chunked into smaller packets and sends the packets into the network. The receiver then reassembles the packets back into the original message. This process is referred to as message segmentation. **Figure Q1(b)** illustrates the end-to-end transport of a message with and without message segmentation. Consider a message that is 12 X 10^6 bits long that is to be sent from source to destination. Suppose each link in the figure is 3 Mbps. Ignore propagation, queuing, and processing delays.

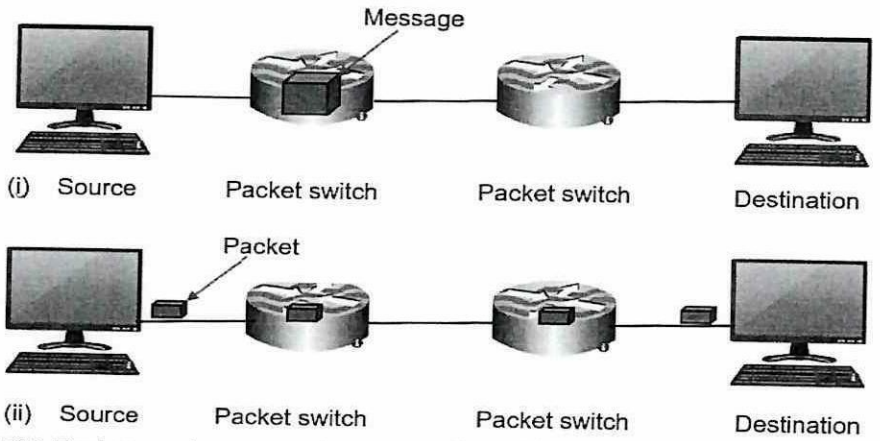

Figure Q1(b) End-to-end message transport: (a) without message segmentation; (b) with message segmentation.

(i) Consider sending the message from source to destination without message segmentation. Execute the total time to move the message from source host to destination host. Find the duration to move the message from the source host to the first packet switch?

(6 marks)

(ii) Now suppose that the message is segmented into 800 packets, with each packet being 10,000 bits long. When the first packet is being sent from the first switch to the second switch, the second packet is being sent from the source host to the first switch. Calculate how long does it takes to move the first packet from source host to the first switch and the second packet be fully received at the first switch.

(6 marks)

Q2 (a) One of the TCP features as a transport-layer protocol is the implementation of end-to-end flow control and error control.

(i) Differentiate the operation of Go Back N with ARQ and Selective Reject for 3 cases: (1) the frame received by the receiver is damaged, (2) the acknowledgment is lost and has not been received by the transmitter, (3) the frame transmitted by the transmitter is lost.

(7 marks)

(ii) A well-known World Wide Web server is set up to receive relatively small messages from its clients while sending them very large messages. Analyze the **TWO(2)** ARQ protocols which are Selective Reject and Go Back N that would provide less of a burden to this server.

(6 marks)

(b) Assuming the IP address formats shown in **Figure Q2(b)**, derive the range of host addresses for classes A, B, and C. Give your answer in dotted decimal notation and also straight decimal.

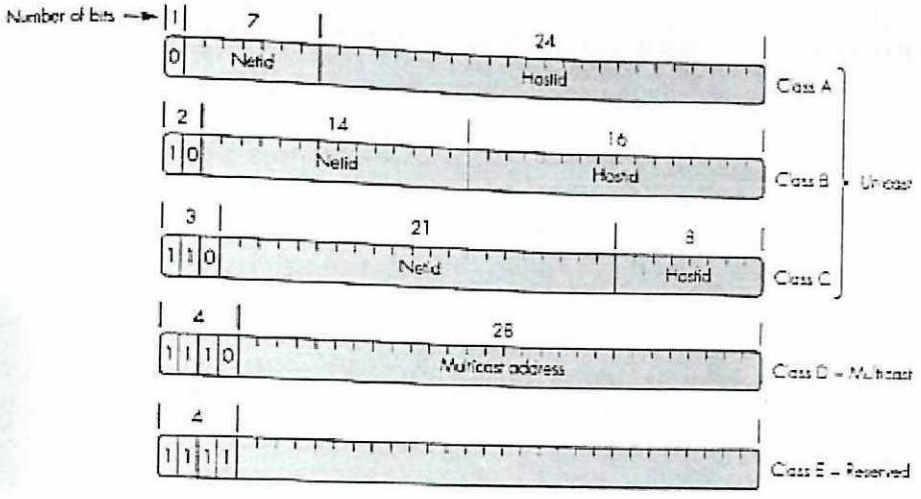

Figure Q2(b) IP address format

(12 marks)

Q3 (a) Consider three LANs interconnected by two routers, as shown in **Figure Q3**.

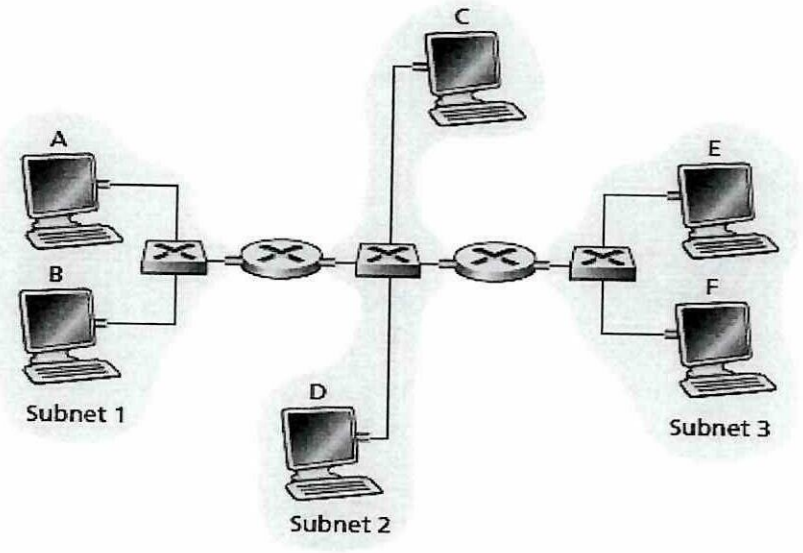

Figure Q3 LANs

(i) Assign IP addresses to all of the interfaces. For Subnet 1, use addresses of the form 192.168.1.xxx; for Subnet 2, use addresses of the form 192.168.2.xxx; and for Subnet 3, use addresses of the form 192.168.3.xxx.

(8 marks)

(ii) Assign MAC addresses to all of the adapters.

(5 marks)

(b) A 3200-bit message must be transmitted through a three-hop wide area network (WAN). Each network link has a maximum capacity of 9600 bps. A fixed packet size of 128 bytes is used to send data over the network. Assuming a propagation delay of 0.002 s per hop and a call setup time of 0.1 s.

(i) Calculate the end-to-end delay incurred to transmit the whole message on a circuit-switched network.

(4 marks)

(ii) Calculate the end-to-end delay incurred to transmit the whole message on a virtual circuit packet switching network.

(8 marks)

Q4 (a) (i) What is a computer network?

(2 marks)

(ii) List **FOUR(4)** types of computer network.

(4 marks)

(b) Twisted pair cable, coaxial cable and optical fiber cable are classified as guided transmission medium.

(i) Draw and label the physical construction of these **THREE(3)** transmissions media.

(6 marks)

(ii) Compare **ONE (1)** advantage and **ONE (1)** disadvantage of each transmission media.

(6 marks)

(iii) State **ONE (1)** factor that affect the selection of this media.

(2 marks)

(c) Differentiate the operation of ALOHA, CSMA and CSMA/CD.

(5 marks)

-END OF QUESTIONS –