UTHM
Universiti Tun Hussein Onn Malaysia

UNIVERSITI TUN HUSSEIN ONN MALAYSIA

FINAL EXAMINATION
SEMESTER II
SESSION 2023/2024

COURSE NAME	:	DATA COMMUNICATION NETWORK
COURSE CODE	:	BEJ31202
PROGRAMME CODE	:	BEJ
EXAMINATION DATE	:	JULY 2024
DURATION	:	3 HOURS
INSTRUCTIONS	:	1. ANSWER ALL QUESTIONS
		2. THIS FINAL EXAMINATION IS CONDUCTED VIA
		☐ Open book
		☒ Closed book
		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

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Q1 (a) The International Standards Organization (ISO) developed the Open Systems Interconnection (OSI) model.

   (i) Draw the seven layer of the OSI model.

(2 marks)

   (ii) Describe function of each layer of the OSI model.

(7 marks)

(b) Explain two types of standards in data communication network.

(4 marks)

(c) Explain different type of topologies in data communication network.

(3 marks)

(d) Differentiate the operation of Hub and Switch using appropriate diagrams.

(4 marks)

Q2 (a) Error detection mechanism has a role to detect errors that occurs between transmission and reception, where one or more bits are altered. A system intends to send a data stream of 1011 1101 0001 1011 0001 0101. Cyclic Redundancy Check (CRC) scheme is used using polynomial generator $x^5 + x^2 + x + 1$. Explain two types of standards in data communication network.

   (i) Compute the CRC code and the transmitted data frame.

(8 marks)

   (ii) At the receiving end, a receiver has received a data frame 1111 1101 1001 1011 0001 0101 01010. Prove with calculation that the received data frame is corrupted.

(8 marks)

(b) Flow control mechanism is very important in data communication assuring that a transmitting entity does not overwhelm a receiving entity with data. Describe the operation of the following flow control techniques.

   (i) Stop and Wait flow control.

(2 marks)

   (ii) Sliding window flow control.

(2 marks)

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Q3 (a) State **TWO (2)** advantages and disadvantages of bus topology.

(2 marks)

(b) Explain how Carrier Sense Multiple Access (CSMA) reduces number of collisions in bus topology.

(3 marks)

(c) Describe the operation of 1-persistance CSMA. State the advantage and disadvantages.

(4 marks)

(d) IEEE 802.3 standards are widely used in today's high-speed LANs. The standards define LAN access method using Carrier Sense Multiple Access/Collision Detection (CSMA/CD) for the medium access control layer. Explain the basic operation of CSMA/CD.

(4 marks)

(e) In a CSMA/CD network with a data rate of 10 Mbps, the maximum distance between any station pair is found to be 2500 m for the correct operation of the collision detection process. Determine the maximum distance if we increase the data rate to 100 Mbps and 1 Gbps. Describe the operation of 1-persistance CSMA. State the advantages and disadvantages.

(4 marks)

(f) Consider building CSMA/CD network running at 1 Gbps over a 1 km cable with no repeaters. The signal speed in the cable is 200,000 km/sec. Determine the minimum frame size.

(3 marks)

Q4 (a) Describe the advantages of packet switching over circuit switching.

(2 marks)

(b) In packet switching, packets are handled in two ways: datagram and virtual circuit. Differentiate these two ways of handling packets with the aid of diagrams.

(6 marks)

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(c)   A simplified network of ABCDEF in a form of weighted graph is shown in **Figure Q4(c)**.

   (i)   Calculate the shortest path from node A to each node and obtain the forwarding table, by using Dijkstra's Algorithm.

   (10 marks)
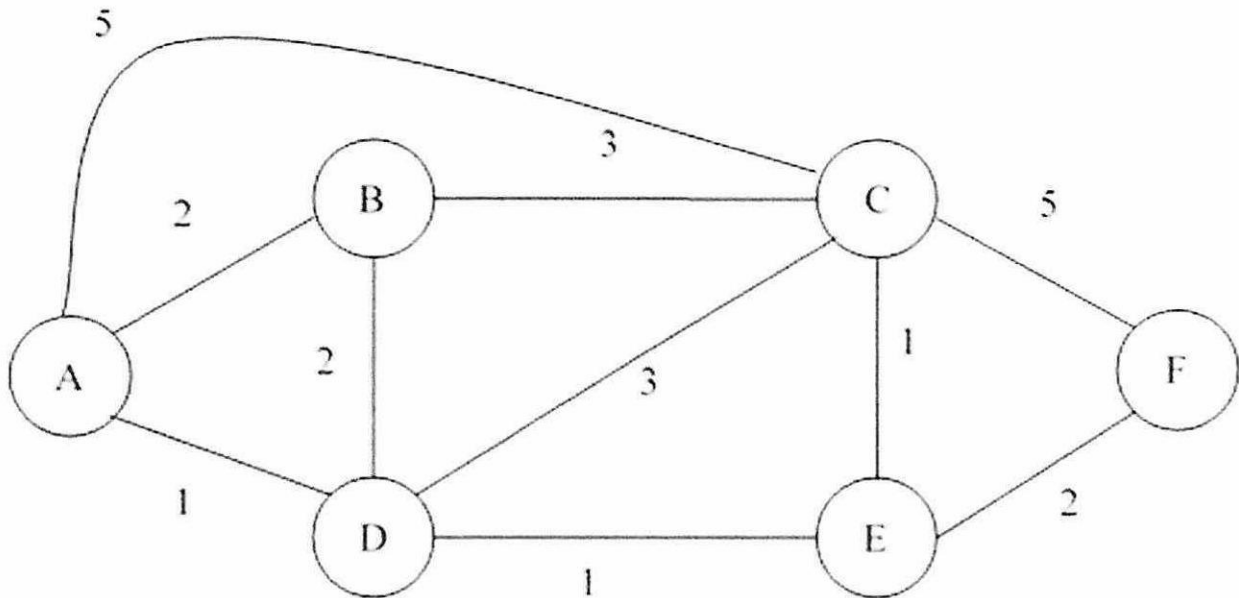
   (ii)   Draw the shortest path.

   (2 marks)

Figure Q4(c)

Q5   (a)   IP addresses are logical address that are given to all devices that are connected to the Internet. In general there are three classes of IP address that can be used by the public, namely class A, B, and C. Provide the following parameter values for each of those three classes.

   (i)   The number of bits for the Network ID and the total number of networks allowed in each class.

   (3 marks)

   (ii)   State the range of network addresses for each class.

   (3 marks)

   (iii)   The number of bit for Host ID and the total number of hosts per network allowed.

   (3 marks)

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(b)   You are a network engineer in an international electronic manufacturing company. The company is allocated with a class C network: 192.168.30.x. You are assigned by the network administrator to create subnets for four departments with the following number of hosts.

> Human Resource Department: 72 hosts
>
> Accounting Department: 35 hosts
>
> Technical Department: 20 hosts
>
> Service Department: 18 hosts

Produce possible arrangement of subnet numbers, subnet mask, and IP addresses to make this possible. (Note: One department could be assigned with more than one subnet)

(11 marks)

- END OF QUESTIONS -

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