UNIVERSITI TUN HUSSEIN ONN MALAYSIA

FINAL EXAMINATION
SEMESTER II
SESSION 2010/2011

COURSE	:	DATA COMMUNICATION
COURSE CODE	:	BEP4223
PROGRAMME	:	BACHELOR OF ELECTRICAL ENGINEERING WITH HONOUR
EXAMINATION DATE	:	APRIL/MAY 2011
DURATION	:	3 HOURS
INSTRUCTION	:	ANSWER **FIVE (5)** QUESTIONS ONLY

THIS QUESTION PAPER CONSISTS OF 7 PAGES

Instruction: Answer five (5) question only (100 marks)

Q1 Data communication is concern on Transmission Control Protocol/ Internet Protocol (TCP/IP) protocol and Open System Interconnection (OSI) protocol.

(a) Classify the OSI layer responsible for the following task.
(i) Determining the path to route the packet
(ii) Providing end-to-end communications with reliable service
(iii) Providing node-to-node communications with reliable service
(iv) Provide the user interface facilities
(v) Managing and control the session

(5 marks)

(b) Ten communication channel sources, six with a bit rate of 200 kbps and four with a bit rate of 400 kbps are to be combine using multilevel TDM with no synchronization bits . Examine:

(i) The size of a frame in bits.
(ii) The input bit duration
(ii) The frame rate.
(iii) The duration of a frame.
(iv) The output data rate.

(15 marks)

Q2 You have an AM broadcast channel which will emit a signal at 1.6Mbps. The broadcast power will be at 300W and the expected noise will be at 16.87W.

(a) By using Shannon and Nyquist Capacity Theorem examine the:
(i) amount of bandwidth required.
(ii) appropriate signal level should be used.

(6 marks)

(b) Assume that the channel is using Go-Back-N-ARQ for data flow control and sending 4 frame namely Frame (0), Frame (1), Frame (2) and Frame (3). Frame (2) corrupted during transmission time and the successful frame is acknowledged for every 2 frame sent. Plan the data flow sequence for this transmission.

(10 marks)

(c) T is a message of Frame (2) that carries 0001110. By using CRC method with $P(x) = x^3+x+1$, evaluate either the message is damage or not.

(4 marks)

Q3 A firm is granted a block of network 98.0.0.0/8.

(a) Categorize the network into five (5) subnets, namely, Net A, Net B, Net C, Net D and Net E. Examine:

(i) the network address for each subnet
(ii) the broadcast address for Net B
(iii) the number of host that can be supported by each subnet.
(iv) the subnet belongs to host 98.96.30.0 by using masking technique

(8 marks)

(b) Construct the iteration and routing table of this network by using Bellman Ford algorithm. Let Net A as source node as shown in **Figure Q3.**

(7 marks)

(c) Assume that the connection is secured using RSA (Rivest, Shamir, Adleman) algorithm with e = 13, d = 37 and N = 77. Generate the ciphertext for message sent 'CAFE' using the values of 00 to 25 for letters A to Z.

(5 marks)

Q4 As a network engineer, you are required to design a network and evaluate its' performance.

(a) Design a bus topology that can support up 25 computers using 10Base2 Ethernet. The length of the network is 1.5 km. Use appropriate device in your design.

(4 marks)

(b) Examine the maximum time taken for a frame from one end (Computer 1) to the other end (Computer 25) if the channel propagation speed is 25×10^8 m/s.

(4 marks)

(c) Assume that Computer 1 is sending a frame at $t_0 = 0$ s, and Computer 25 is also sending a frame at $t_1 = 0.4\mu s$, predict the time Computer 25 will notice about the collision (t_2).

(4 marks)

(d) Determine the bits that Computer 1 and Computer 25 had sent before it detects the collision.

(4 marks)

(e) For channel upgrading purpose, evaluate:

(i) the maximum frame size for this channel.

(ii) the maximum frame size if we increase the data rate up to 100Mbps.

(4 marks)

Q5 Consider a transfer of a file in bus topology network containing 1 million 8-bit characters between 2 stations 1km apart. The network is using 10Base2 cable and the frame size is 256 bit including 80 bit overhead. Each frame is acknowledged by an 88-bit frame before the next frame is sent. The propagation time for the bus is 200m/µs.

(a) Compute the amount of data bit per frame.

(2 marks)

(b) Identify the time taken to transmit data packet from sender to receiver (T_d).

(3 marks)

(c) Examine the transmit time to sent ACK from receiver to sender (T_a).

(3 marks)

(d) Predict the propagation time from sender to receiver (T_p).

(3 marks)

(e) Determine the time for one complete cycle time.

(4 marks)

(f) Verify the total time required to sent a file.

(5 marks)

Q6 Assume a digital circuit-switch network with bandwidth of 1 Mbps. To ensure the connectivity, setup and teardown phase is required and it use 1000 bits. The distance between parties is 5000km apart. The propagation speed of the network is 2×10^8 m/s.

(a) Predict total delay if 100 000 bits of data is exchanged during data transfer phase.

(5 marks)

(b) Consider that the network is using multistage switch network. By referring to **Figure Q6 (b)**, generates total crosspoints for that network.

(4 marks)

(c) Five (5) equal-size datagram belonging to same message is transfer in this network using multiple paths as shown in **Table Q6 (c)**. We assume that the delay for each switch including waiting and processing is 3, 10, 20, 7 and 20 ms respectively. Examine the order of datagram arrive at destination and delay for each. Ignore any other delay in transmission.

(6 marks)

(d) Discuss the differences between circuit-switching and packet-switching network.

(5 marks)

Q7 Consider a compressed video transmission in an Asynchronous Transfer Mode (ATM) network. Suppose that the ATM cell is being transmitted through several switches.

(a) Give in own words why Virtual Path Connection (VPC) concept has been introduced in high-speed networking.

(4 marks)

(b) 64kbps Pulse Code Modulation (PCM) coded speech is packetized into a constant bit rate ATM cell stream. Assume that each cell holds 48 bytes of speech and has 5 byte header. Evaluate

(i) the time taken to send one full cell.
(ii) the time taken to transmit the cell at 155 Mbps.
(iii) the highest cell rate that can be occur in this system.

(6 marks)

(c) An ATM network uses a token bucket scheme for traffic shaping. A new token is put into that bucket for every 5μs, where each token can sent up to 200 000 cell/sec. One cell contains 48 bytes of data. Predict the sustainable data rate.

(5 marks)

(d) Explain how the Quality of Service (QoS) and congestion control are related.

(5 marks)

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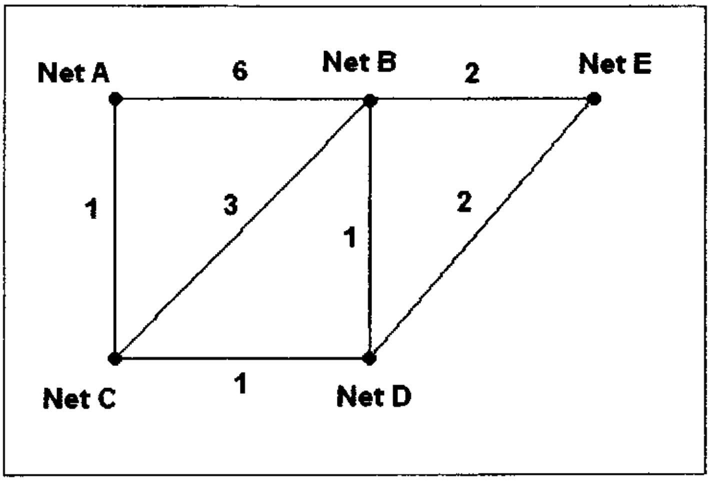

Figure Q3: Network Block 98.0.0.0/8

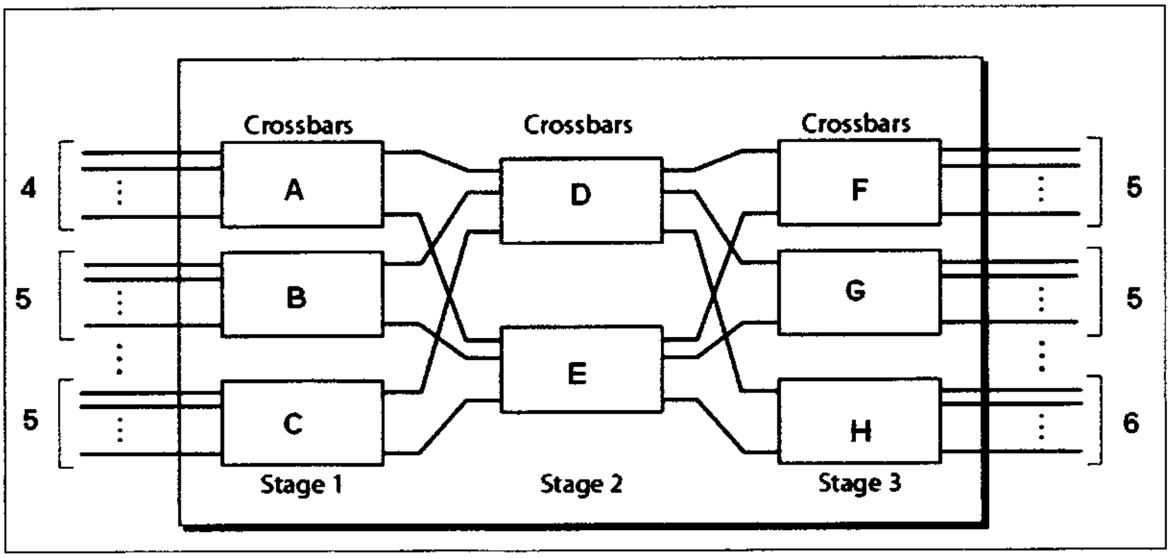

Figure Q6 (b): Multistage switch

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Table Q6 (c)

Datagram	Path Length	Visited Switch
1	3200 km	1,3,5
2	11 700 km	1,2,5
3	12 220 km	1,2,3,5
4	10 200 km	1,4,5
5	10 700 km	1,4,3,5