



UNIVERSITI TUN HUSSEIN ONN MALAYSIA

FINAL EXAM SEMESTER II SESSION 2008/09

SUBJECT NAME : DATA COMMUNICATION
SUBJECT CODE : BEP4223
COURSE : 4BEP
EXAM DATE : APRIL 2009
DURATION : 3 HOURS
INSTRUCTION : ANSWER FIVE (5) OUT OF SEVEN (7) QUESTIONS

THIS EXAM PAPER CONSIST OF 7 PAGES

ANSWER FIVE (5) OUT OF SEVEN (7) QUESTION

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

- (a) Identify 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) Suppose the TCP entity receives a 1.5 Megabyte file from the application layer. The file is chunked into multiple packets with each packet consist of 1500 bytes including 40 bytes overhead. Predict the number of packets that will be used to transfer this file.
- (5 marks)
- (c) Consider a computer is moved from one department to another. Justify and give reason does the physical address and IP address need to change.
- (5 marks)
- (d) Assume the end-to-end IP packet transfer. Illustrate the flow of a data packet in OSI layer from sender-to-router-to-router-to-destination.
- (5 marks)

Q2 Consider a noisy channel telephone line. The output noise level of this channel is measured as $4.5 \mu\text{W}$ and the signal level is 5mW . The bandwidth used is 3KHz .

- (a) By using Shannon Capacity Theorem examine the:
- (i) SNR_{dB} of the channel.
 - (ii) capacity of the channel
- (4 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. Plans the data flow sequence for this transmission.
- (10 marks)

- (c) The data sent in the Frame (0) is 01010111. Construct the data sent by using NRZ-L and Manchester encoding scheme. (4 marks)
- (d) The corrupted message of Frame (2) is T = 0001110. Justify that the message is damage by using CRC method with $p(x) = x^3 + x + 1$. (2 marks)

Q3 A firm is granted a block of network 98.0.0.0/8 (Figure Q2).

- (a) Categorize the network into 5 subnet, namely, Net A, Net B, Net C, Net D and Net E. Identify:
- (i) the network address for each subnet
 - (ii) the number of host that can be supported by each subnet.
 - (iii) the subnet belongs to host 98.96.30.0 by using masking technique
- (6 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 Q2. (9 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 'BEACH' 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 $t_1 = 0.4\mu\text{s}$, 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:
(i) Predict the maximum frame size for this channel.
(ii) Distinguish 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 data rate of the network is 10Mbps 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 $200\text{m}/\mu\text{s}$.

- (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 Q5 (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 Q5 (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-switched network and datagram network.
(5 marks)
- Q7** Consider a connection using ATM network
- (a) Outline three (3) points the need of merging technology from frame relay network to ATM network.
(5 marks)
- (b) Weighted fair queuing is used to combine the five ATM service categories onto one single ATM transmission link. Design the schedule for this network.
(5 marks)
- (c) Assume that Leaky Bucket is used to control the network flow. The input rate is 300Mbps and output rate is 100Mbps. There is input flow for 12s and no input for 48s. Identify how many inputs are left?
(5 marks)
- (d) An ATM network has lost 5 cell out of 10 000 and 2 are in error. Construct it's CLR (Cell Lost Ratio) and CER (Cell Error Ratio)?
(5 marks)

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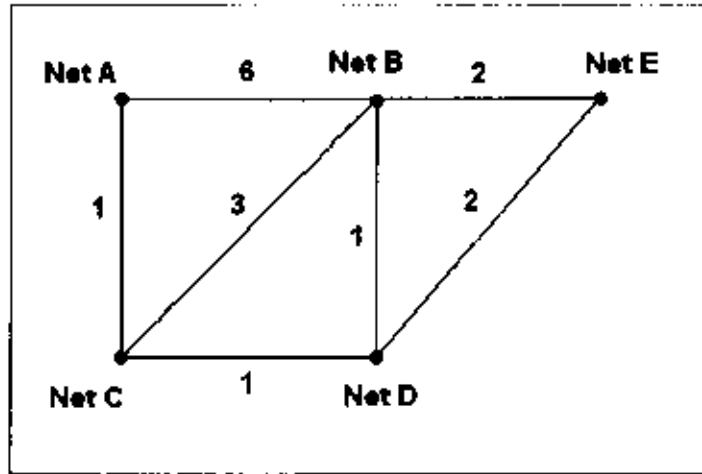


Figure Q2: Network Block 98.0.0.0/8

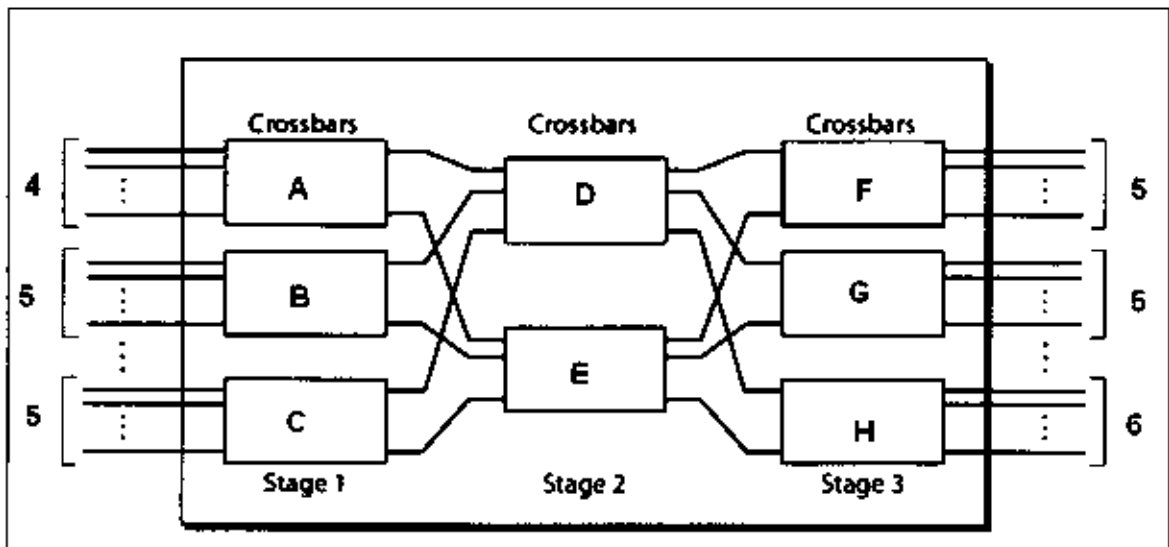


Figure Q5 (b): Multistage switch

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Table Q5 (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