UTHM
Universiti Tun Hussein Onn Malaysia

UNIVERSITI TUN HUSSEIN ONN MALAYSIA

FINAL EXAMINATION
SEMESTER I
SESSION 2018/2019

COURSE NAME	:	DATA COMMUNICATION NETWORK
COURSE CODE	:	BEB 40102
PROGRAMME CODE	:	BEJ
EXAMINATION DATE	:	DECEMBER 2018/ JANUARY 2019
DURATION	:	2 HOURS 30 MINUTES
INSTRUCTION	:	ANSWERS FOUR (4) QUESTIONS ONLY

THIS QUESTION PAPER CONSISTS OF **SIX (6)** PAGES

Q1   (a)   Describe the function of a router. Identify which layer of the OSI model it operates.

                                                                  (5 marks)

         (b)   A transmitter is sending a signal to the receiver over the wireless channel. The distance of between transmitter and receiver is 10 km. The channel spectrum used for that trasmission is between 88 MHz and 90 MHz. The transmitted signal power is 100 W with attenuation 0.5 dB/km. Assuming the channel produces 5 dB of noise level, calculate:

                 (i)   the channel capacity in bps using Shannon capacity formula.

                                                                  (6 marks)

                 (ii)   the required signaling level for signal transmission.

                                                                      (4 marks)

         (c)   Explain why the Medium Access Control (MAC) of the IEEE 802.11 uses carrier sense multiple access with collision avoidance (CSMA/CA) instead of carrier sense multiple access with collision detection (CSMA/CD).

                                                                (6 marks)

         (d)   Analyze the blocking condition of the three-stage space division switch shown in **Figure Q1(d)**. The heavier lines indicate the lines that are already in use.

                                                                (4 marks)

Q2   (a)   Explain the differences between the Manchester and Differential Machester encoding scheme.

                                                                (8 marks)

         (b)   By using an appropriate example, discuss if there is a synchronization problem when a long stream of bit 1 and long stream of bit 0 are sent using the Pseudoternary encoding scheme.

                                                                 (8 marks)

         (c)   A stream of 10011011101001 is received at the receiver. The generator polynomial is $x^4 + x^3 + 1$. Evaluate whether this stream of data contains any error.

                                                                (9 marks)

Q3 (a) Discuss the differences between the TCP and UDP protocols in terms of reliability, connection, efficiency and flow control.

(7 marks)

(b) Compare between datagram and the virtual circuit.

(6 marks)

(c) A 20 kByte file is to be transferred across a packet-switching network from node A to node F. The path from node A to node F passes through 5 links, and 4 intermediate nodes. Each of the links is a 10 km optical fiber with a rate of 10 Mbps. The propagation speed through optical fiber is 2×10^8 m/s. The 4 intermediate nodes are store-and-forward devices and each intermediate node performs 50 μs routing table look up after receiving a packet before it can begin sending it on the outgoing link. Analyse the total time taken to send the entire file across the network if the packet size is
(i)   1 kByte
(ii) 4 kByte
Ignore the size of the packet header.

(12 marks)

Q4 (a) Explain why IP is considered as the best-effort protocol.

(4 marks)

(b) Suppose a protocol architecture has defined four layers for communication: base layer, net layer, transport layer, and max layer. The header length of the base layer and of the net layer is 2 bytes; and the transport layer, 3 bytes; and max layer, 4 bytes. In addition, each layer has a 4-bit trailer. If a 50-byte packet is received, calculate the size of the actual data (in bytes).

(6 marks)

(c) "Both Ethernet and 802.11 use Carrier Sense with Collision Detection to ensure fair media access for multiple parties on a LAN."
Discuss if the statement above is true or false.

(5 marks)

(d) Apply Dijkstra's routing algorithm to the network in **Figure Q4(d)** from source node N1 to all other nodes.

(10 marks)

Q5 (a) Identify the layer of the OSI protocol stack which is associated to each of the following items:
  (i) Routing
  (ii) Telnet
  (iii) Manchester encoding
  (iv) Cyclic Redundancy Check
  (v) High-Level Data Link Control Protocol
  (vi) User Datagram Protocol

  (6 marks)

(b) On a certain network 1,000,000 bytes of data needs to be transmitted using asynchronous transmission, using 7 data bits, 1 start bit, 2 stop bits and 1 parity bit. If the transmission is at 56 kbps, determine how long it would take to transmit the overhead and transmit the whole frame into the medium.

  (8 marks)

(c) A router interface has been assigned an IP address of 172.16.192.166 with a mask of 255.255.255.248. Determine the subnet that the IP address belongs to.

  (6 marks)

(d) In a sliding window Go-Back-N ARQ system, A sends packets 0,1,2,3,4,5 and 6. Packet 3 arrives at B corrupted. Determine what do A and B send to each other next.

  (5 marks)

Q6 (a) With regards to the IP version 4 addresses, provide:
  (i) the number of bits for the Network ID and the total number of networks allowed in class A, B and C.

  (ii) the number of bit for Host ID and the total number of hosts per network allowed in class A, B and C.

  (8 marks)

(b) Recommend a suitable change to the network design in **Figure Q6(b)**. Explain your answer.

  (5 marks)

(c) For the network 172.48.24.0/21, determine:
  (i) the subnet mask,
  (ii) the total number of IP addresses per subnet,
  (iii) the first usable IP address on the first subnet, and
  (iv) the last usable IP address on the first subnet.
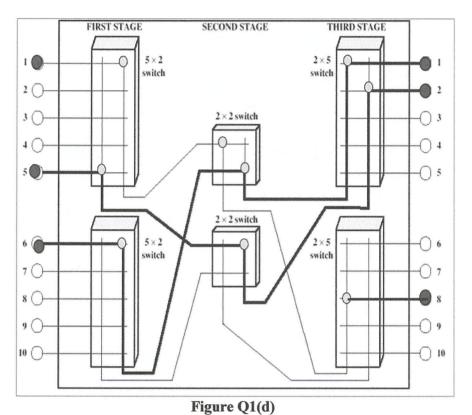
  (12 marks)

-END OF QUESTIONS –

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Figure Q1(d)

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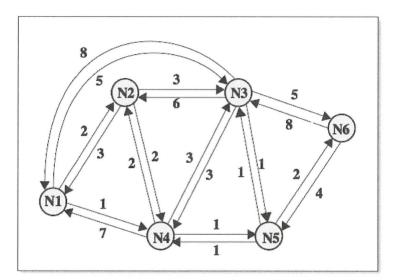COURSE NAME: DATA COMMUNICATION & NETWORK   COURSE CODE: BEB40102
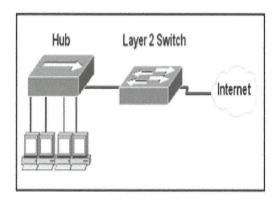

Figure Q4(d)

Figure Q6(b)