



MULTIMEDIA UNIVERSITY COLLEGE OF KENYA
(A CONSTITUENT COLLEGE OF JOMO KENYATTA
UNIVERSITY OF AGRICULTURE AND TECHNOLOGY)

UNIVERSITY EXAMINATIONS 2012/2013

SECOND/THIRD YEAR SUPPLEMENTARY EXAMINATIONS FOR THE
DEGREE OF BACHELOR OF SCIENCE IN TELECOMMUNICATION AND
INFORMATION ENGINEERING

ETI 2206/2313: COMPUTER NETWORKS

DAY/ DATE: Thursday, March 21, 2013

TIME: 2pm-4Pm Venue: LR8

INSTRUCTIONS

Answer question **ONE** and **ANY OTHER TWO** questions

QUESTION ONE

- a. A mesh network topology has 7 nodes. Determine the:
- Total number of cable links required;
 - Number of ports for each node.

(4 marks)

- b. Token Ring medium access protocol.

(6 marks)

- c. A given host IP address is 55.66.25.6 and subnet mask is 255.192.0.0. Determine the:

- Last host address of the major network;
- subnet address for the given host IP address;
- Range of host addresses for this subnet;
- Broadcast address for this subnet;

(6 marks)

Handwritten calculation:
4
+ 4
8
+ 5
13
6
19
15
24

- d. A series of information frames with a mean length of 500 bits is to be transmitted across a data link 2000km long at a data rate of 1 Mbps. If the link has a velocity of propagation of 2×10^8 m/s and a bit error rate (BER) of 10^{-5} . Determine the link utilization efficiency assuming that only one frame is and acknowledgment received before another is sent.

(6 marks)

- e. With the aid of a block diagram describe how the transfer of data from application layer X to application layer Y is achieved in network with respect to TCP/IP protocol model.

(8 marks)

QUESTION TWO.

- a. Describe the Carrier Sense Multiple Access with Collision Detection (CSMA/CD) medium access protocol.

(4 marks)

- b. Draw the UDP header and briefly describe the function of each field.

$$4 \times 10 = 40 \text{ bits} \quad 50 = \frac{40}{5} = 50 \times 1.25 = \frac{200}{1.25}$$

(10 marks)

- c. A token ring network has the following characteristics:

Speed of operation, $R = 4 \text{ Mbps}$.

Number of stations, $M = 10$.

Distance of separation of stations, $D = 50 \text{ m}$.

Delay introduced by each station interface, $B = 1.25 \text{ bits}$.

Length of the frame, $L = 200 \text{ bits}$.

Given that the token insertion strategy is to re-insert the token after the frame transmission is completed but not until the last bit of the frame returns to the sending station, determine the:

- Duration in μs for a bit to go round the ring;
- Duration in μs for the last bit in a transmitted frame to return;
- Ring efficiency.

$$4 \times 50 = 1025$$

(6 marks)

QUESTION THREE.

- a. Draw the IPv4 header and briefly describe the function of each field.

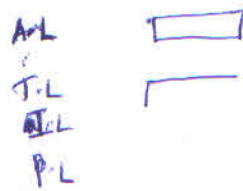
(9 marks)

- b. 50 nodes are connected to a 1 km length of coaxial cable. Using some protocol, each node can transmit 65 frames per second where the average length is 1800 bits. The transmission rate at each node is 8 Mbps. What is the numerical value of the efficiency of this protocol?

(6 marks)

- c. A base-band LAN using bus topology of length 1 km has a number of of equally spaced stations at 2.5 m. The data rate is 10 Gbps and propagation velocity is $2 \times 10^8 \text{ m/s}$. Determine:

- i. The time required to send a frame of 1000 bits between the farthest stations;



CTS
SDU
POV
CF

10
-16
54

- ii. The duration it takes in seconds, before a station notices an interference if two adjacent stations begin to transmit at exactly the same time. (5 marks)

QUESTION FOUR.

- a. Describe Token Ring LAN medium access protocol.

(8 marks)

- b. A connection-oriented network has the following characteristics:

Length between any pair of stations	= 500 Km.
Number of nodes across the network	= 50
Data rate	= 10^4 bps
Propagation velocity	= 2×10^8 m/s
Set up time required by each node	= 20 ms

- i. Compare the total times required to transmit messages of lengths 10^6 and 10^3 .
- ii. Compare the efficiencies of transmitting the two messages.

(12 marks)

- e. With the aid of a block diagram describe how the transfer of data from application layer X to application layer Y is achieved in network with respect to TCP/IP protocol model.

(8 marks)

QUESTION TWO.

- a. Describe the Carrier Sense Multiple Access with Collision Detection (CSMA/CD) medium access protocol.

(4 marks)

- b. Draw the UDP header and briefly describe the function of each field.

(10 marks)

- c. A token ring network has the following characteristics:

Speed of operation, $R = 4$ Mbps.

Number of stations, $M = 10$.

Distance of separation of stations, $D = 50$ m.

Delay introduced by each station interface, $B = 1.25$ bits.

Length of the frame, $L = 200$ bits.

Given that the token insertion strategy is to re-insert the token after the frame transmission is completed but not until the last bit of the frame returns to the sending station, determine the:

- i. Duration in μs for a bit to go round the ring;
- ii. Duration in μs for the last bit in a transmitted frame to return;
- iii. Ring efficiency.

(6 marks)

QUESTION THREE.

- a. Draw the IPv4 header and briefly describe the function of each field.

(9 marks)

- b. 50 nodes are connected to a 1 km length of coaxial cable. Using some protocol, each node can transmit 65 frames per second where the average length is 1800 bits. The transmission rate at each node is 8 Mbps. What is the numerical value of the efficiency of this protocol?

(6 marks)

- c. A base-band LAN using bus topology of length 1 km has a number of equally spaced stations at 2.5 m. The data rate is 10 Gbps and propagation velocity is 2×10^8 m/s. Determine:

- i. The time required to send a frame of 1000 bits between the farthest stations;