



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

FACULTY OF ENGINEERING AND TECHNOLOGY

UNIVERSITY EXAMINATIONS - 2012/2013

SECOND YEAR SECOND SEMESTER EXAMINATION FOR THE DEGREE OF BACHELOR OF SCIENCE IN TELECOMMUNICATION & INFORMATION ENGINEERING

ETI 2206 COMPUTER NETWORKS

DAY & DATE: Tuesday December 18, 2012

TIME: 11.00 – 1.00 PM

VENUE: LR3

INSTRUCTION TO CANDIDATES

Attempt Question One and Any Other Two questions

$$\frac{n(n-1)}{2} = \frac{5(5-1)}{2} = \frac{5 \times 4}{2} = 10$$

Physical layer

QUESTION ONE – 30 MARKS (COMPULSORY)

- a. A mesh network topology has 5 nodes. Determine the:
- Total number of cable links required;
 - Number of ports for each node.

$$n-1 = 5-1 = 4$$

(4 marks)

- b. Describe the Carrier Sense Multiple Access with Collision Detection (CSMA/CD) medium access protocol. (4 marks)

- idle, tx
- busy, wait
- CS, sensing signal, cease tx
- wait random time, transmit
E (No kia)

A given host IP address is 17.110.25.6 and subnet mask is 255.224.0.0. Determine the:

- Last host address of the major network; - 17.0.0.0
- Subnet address for the given host IP address; 17.110.0.0
- Range of host addresses for this subnet; 17.110.0.1 - 17.110.0.254
- Broadcast address for this subnet; 17.110.0.255

(6 marks)

- d. A series of information frames with a mean length of 1000 bits is to be transmitted across a data link 4000km long at a data rate of 2 Mbps. If the link has a velocity of propagation of 2×10^8 m/s and a bit error rate (BER) of 10^{-4} . Determine the link utilization efficiency assuming that only one frame is transmitted and acknowledgment received before another is sent. (5 marks)

$$\frac{D}{V} = \frac{2 \times 10^6 \times 10^3}{2 \times 10^8}$$

- 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 OSI model. (11 marks)

Repl Go

- Each device has a ~~data~~ ^{control} point - to-point with 2 devices on either side.
- A signal is passed along the ring in one direction from device to device until it reaches its destination.
- Each device in the ring has a regenerative repeater.
- Equal access is given to each device through a packet called token.
- When a node receives the token, it removes it from the ring and transmits 1 frame, then puts the token back on the ring (i.e. transmits it to next node).

QUESTION TWO - 20 MARKS

a. Describe Token Ring LAN medium access protocol (10 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

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

(10 marks)

QUESTION THREE - 20 MARKS

- Idle, wait for DIFS, send control frame RTS
- Receiving station, wait SIFS, CTS
- send data frame, after SIFS
- Receiving, ACK

a. Describe the Carrier Sense Multiple Access with Collision Avoidance (CSMA/CA) medium access protocol (8 marks)

b. Consider a TCP connection using the slow-start congestion control scheme with an initial THRESHOLD value of 64 KB and a Maximum Segment Size (MSS) of 4 KB. The receiver's advertised window is initially 24 KB. The first transmission attempt is numbered 0, and all transmission attempts are successful except for Timeouts on attempt number 4. In the ACKs for transmission attempt number 9 and subsequently, the receiver's advertised window is reset to 20 KB. Find the size in KB of the sender's congestion window for its first 12 transmission attempts i.e., transmission numbers 0 - 11. (12 marks)

QUESTION FOUR - 20 MARKS

a. Draw the TCP segment format and briefly describe the function of each field. (13 marks)

b. Consider a 200-meter 4Mbps token ring containing 20 stations, each transmitting with equal priority. Suppose no station is allowed to transmit more than 5000 data octets before giving up the token. Once a station gives up a token how long will it take (in the worst case) for that station to get the token again? (7 marks)

1. Bit field sent once by station (control) (RTS)
2. If idle, wait 4 times - this is the amount of time (SIFS)
3. If idle, send data frame and waiting for time (CTS)
4. If busy, station sends a control frame indicating that receiving station is busy.