Computer Engineering Department
King Fahd University of Petroleum and Minerals

COE 441: Local Area Networks

Second Major Exam
Date: August 2nd, 2004

Time: 4:30PM – 6:30PM

Instructor: Uthman Baroudi

Student Name:----------
Student ID:----------

	Max	Earned
Problem 1	30	
Problem 2	30	
Problem 3	40	
Problem 4	40	
Problem 5	20	
Total	160	

Notes:
Be a smart exam taker:
If you get stuck on one problem go on to another problem.
Don't waste your time giving irrelevant (or not requested) details.
Go over all questions and start with what you know first.
SHOW ALL YOUR WORK.
For all your calculation assume the propagation speed to be 200 m/μs

Problem # 1 (30 marks)

*(6 points)***Choose the best answer:**

1) Consider the IEEE 802.3 standard, after 5 collisions, the possible backoff slots are between 0 and
   a) 5
   b) 31
   c) 32
   d) 33
2) Forty stations are on an Ethernet LAN. A 10-port bridge segments of the LAN. What is the effective average data rate of each station?
   a) 40 Mbps
   b) 10 Mbps
   c) 5 Mbps
   d) 2.5 Mbps

3) What is the efficiency of 8B/10B encoding?
   a) 20%
   b) 40%
   c) 60%
   d) 80%
4) the _____ level is a value assigned to each station by the network manager
   a) station priority
   b) current priority
   c) current reservation
   d) station reservation]

5) A token is typically released when_____.
   a) A frame arrives at a station
   b) A frame at its originating station
   c) A frame arrives at its destination station
   d) A station becomes the Monitor station

6) Token Ring protocol specifies that _____ when frame reach its destination station.
   a) The message is copied
   b) Four bits in the packet are changed
   c) The message is taken off the ring and replaced by the token.
   d) a and b

Fill in blanks in the following sentences:

7) *(8 points)*In a Token Ring network (no priority applied), when a station wants to transmit, it dose the following actions:
   a)
   b)
   c)
   d) Passes the frame back out.

8) The IEEE 802.5 standard defines three basic frame types: a) _____, b) _____, and c) _____.
9) The *Token Claiming* process is an important part of Ring management. This process can be triggered by any of the following events: a) _____, b) _____ and c) first station to attach to the ring.

10) *(13 points)* Considering Ethernet and Token Ring technologies, answer the following **True/False** questions:
   a) [ ] Contention approaches such as CSMA/CD (Ethernet) work better for small networks that have low usage.
   b) [ ] The MTU of the 10Mbps Ethernet is 1500 bytes and the MTU of the 100Mbps Ethernet is 15000 bytes
   c) [ ] Encoding in Ethernet implementation is medium independent while in 10 Gigabit Ethernet is medium dependent.
   d) [ ] 10 Gigabit Ethernet is a shared domain (i.e. half-duplex) technology.
   e) [ ] In 10 Gigabit Ethernet, the link distances are determined by optics and not by the diameter of an Ethernet collision domain.
   f) [ ] 10 Gigabit Ethernet uses the IEEE 802.3 Ethernet media access control (MAC) protocol, but the frame format and frame size are different from the IEEE 802.3.
   g) [ ] In contrary to Ethernet, 10 Gigabit Ethernet targets three application spaces: the LANs, MANs, and WANs.
   h) [ ] Token passing offers the highest data throughput possible under high traffic conditions.
   i) [ ] Generally, response time in token rings is less consistent than Ethernet.
   j) [ ] Token passing is deterministic. Each station is NOT guaranteed an opportunity to transmit each time the token travels around the ring
   k) [ ] There are limits on how long a computer can transmit in token ring networks, so that no one monopolizes the network.
   l) [ ] Token passing involves complicated protocols for managing the network and recovering from errors. The traffic associated with these protocols has higher band width overhead then is required for CSMA.
   m) [ ] Ethernet is so popular because the cables, NICs, and hubs cost much less than their token ring counterparts. Ethernet can also be segmented to relieve overloading.

11) *(3 points)*The FDDI network uses the Release After Transmission (RAT) technique, rather than the Release After Reception (RAR) technique Answer the following **True/False** questions.
   a) [ ] RAT is much more efficient when the frame length is shorter than the length of the ring.
   b) [ ] More than one Token can exist on the Ring at a given time.
   c) [ ] More than one data frame can exist on the Ring at a given time.

Problem # 2 (30 marks)

1) *(10 points)* Describe the *timed token rotation* protocol used for asynchronous traffic access in FDDI. Your explanation should include an explanation of *target token rotation time*. What is *synchronous* traffic, and how is access for this type of traffic handled?

2) *(20 points)* A small FDDI ring connects three stations, A, B, and C, all with synchronous traffic allocations of 2 ms. Station A has time-critical traffic and requires that the token rotation time should never exceed 16 ms. What TTRT should A bid during initialization? Assume that the TTRT bid by A wins and that the ring latency and token transmission time are both negligible. Calculate (by a timing diagram or otherwise) the TRT observed by A, and hence how A's requirement is met, during the first three circulations of the token following the (simultaneous) appearance of data to transmit at all stations on a previously quiet ring.

Problem # 3 (40 marks)

1. *(10 points)* Illustrate the data frame structure for Token Ring networks showing the basic components.

2. *(10 points)* Find the minimum length of a 16-Mbps Token Ring network. Justify your answer.

3. *(10 points)* Consider a slotted ring of length 10 km with a data rate of 16Mbps and 200 repeaters, each of which introduces a 1-bit delay. Each slot contains room for one source address, one destination address byte, two data bytes and five control bits. How many slots are on the ring?

4. *(10 points)* Describe how the Dedicated Token ring works.

Problem # 4 (40 marks)

1. *(2 points)* Why does slotted Aloha accomplish twice the capacity of non-slotted Aloha?

2. *(3 points)* How does CSMA reduce the period of vulnerability?

3. *(6 points)* What is the impact of channel bandwidth, packet size and physical distance on the performance of CSMA?

4. *(8 points)* An Ethernet MAC sublayer receives 1520 bytes of data from the LLC sublayer; can the data be encapsulated in one frame? If not, how many frames need to be sent? And what is the size of the data in each frame? And what is the size of each transmitted frame?

5. *(9 points*) Numerate and briefly explain the three defined methods to assure a proper operation of the Gigabit Ethernet half-duplex approach

6. *(3 points*) Assume four computers A, B, C, D connected to an Ethernet switch. Describe a case when the Ethernet switch will improve the total throughput of the network

7. *(9 points)* Compare the different Fast Ethernet implementations using the following table:

Implementation	*Media*	*Encoding methods*
1000Base-TX		
1000Base-FX		
1000Base-T4		

Problem # 5 (20 marks)

Fibre Channel technology is designed to combine the best features of Channel technology and Network technology. Discuss briefly the Fibre Channel protocol Architecture focusing on the protocol's levels, functionalities of each levels as well as classes of services provided by this protocol.