

Second Semester 2004/ 2005
CPE 0907422 Computer Networks (Section 2)
Thursday, March 31, 2005
Exam 1

Student Name: _____

Student No.: _____

STOP

Please read the following paragraph carefully:

There are 5 questions and 4 pages in this exam booklet. You can attempt to answer any 4 or all the 5 the questions. The exam will be graded out of 100 points. When your paper is graded, all questions you attempt will be given equal weights (i.e. 25 points each if you attempt 4 or less questions; 20 points each if you attempt all 5 questions). If you attempt to answer 4 questions, you can get a maximum of 100 points. If you attempt to answer the 5 questions, you will be given a bonus of 15% over the grade you score.

You have one hour. Good Luck!

1. Assume a generator polynomial $G(x) = x^6 + x^2 + x + 1$ and a frame 10110101001010.
 - a) Give the CRC for this $G(x)$ and frame.
 - b) Give the shift register corresponding to $G(x)$.

2. Draw a timeline diagram (up to frame 7) that for the sliding window algorithm with $SWS=4$ frames and $RWS=3$ frames, when the third frame (frame 2) is lost. The receiver use cumulative ACKs. Use a timeout interval of about $2 \times RTT$. Assuming that the transmit time (insertion delay) of a frame is equal to $0.25 RTT$ and the frames can be processed instantaneously if they arrive in order. On each data frame and ACK frame, you need to indicate the sequence number (start from 0). In addition, you need to indicate what action is taken by the receiver when it is received, for example, processed, buffered, and discarded.

3. Consider a token ring network like FDDI in which a station is allowed to hold the token for some period of time (the token holding time, or THT). Let RingLatency denote the time it takes the token to make one complete rotation around the network when none of the stations have any data to send.
 - a) In terms of THT and RingLatency, express the efficiency of this network when only a single station is active.
 - b) What setting of THT would be optimal for a network that had only one station active (with data to send) at a time?
 - c) In the case where N stations are active, given an upper bound on the token rotation time, or TRT, for the network.

4. Consider a network path consisting of four 10 Mbps Ethernet links connected by three store-and-forward switches. Assume that each link introduces a propagation latency of 10 microseconds, but the switches introduce no queuing delays.
 - a) Calculate the path's one-way latency (total packet delay) for sending a 1KB message
 - b) Calculate the effective bandwidth for sending a 1KB message across this path.
 - c) Calculate the effective bandwidth for sending a sequence of 1KB messages if the source must wait for a 20-byte ACK of the previous packet before it can send the next packet.

5. Given the extended LAN shown below,
- Indicate which ports are not selected by the spanning tree algorithm.
 - Focusing on the activity at node B5, show the sequence of events from the time when all bridges boot at the same time until the system stabilizes. Denote a configuration message from node X in which it claims to be distance d from root node y as (Y, d , X)

