CMPUT 313 (SECTION B1)
Telecommunications and Computers
Prof. L Nikolaidis
FINAL EXAM
WEIGHT: 38%
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Student Name: _____

Student ID: _____

Enter your name and student ID in the space provided above. This question sheet must be returned along with your exam booklet. This is CLOSED BOOK exam. All intermediate steps, all intermediate results and all assumptions used in the answers must be provided in order to obtain full marks. All questions are of equal weight.

1. Consider a token bucket and a leaky bucket. The output of the token bucket is connected to the input of the leaky bucket. All packets are of equal size. A packet needs to consume a single token in order to proceed. The token bucket can hold 200 tokens. The replenishment rate of the token bucket tokens is three tokens per unit of time. The leaky bucket rate is five packets per unit of time. The output link speed of both the token and the leaky bucket is ten packets per unit of time. Provide a diagram and explain the output of the leaky bucket if a burst of 300 packets arrives almost instantly at the input of the token bucket. Assume that sufficient packet buffers exist at both the token and the leaky bucket to ensure that losses due to buffer overflows do not occur. (The token bucket is initially full. The formula describing the output of a token bucket is: $C + \rho S = MS$ where C is the token bucket capacity, ρ is the token replenishment rate, S is the burst duration and M is the output link speed.)
2. Consider a fictitious Internet with CIDR routing. In this network, class C addresses are represented by a four bit network ID followed by a four bit host ID. How would you assign the available pool of class C addresses in order to satisfy the following four network requests: (1) a network of 10 nodes, (2) a network of 100 nodes, (3) a network of 64 nodes and (4) a network of 20 nodes. Provide you answer in a prefix/bitmask form.
3. When using a CRC generator polynomial $G(x)$ of degree r, the probability that a burst error of length $r+1$ will go undetected is $1/2^{r-1}$. Explain why.
4. Consider the following variation of the Selective-Reject ARQ protocol: Sending an ACK(n) means that all frames with sequence number less or equal to n-1 have been received successfully, except the frames for which a NACK(j) has been specifically sent (with j being the sequence number of the "missing" frame). Can you see any problems with this scheme? Explain.
5. Consider the adaptive tree walk protocol and its extensions. Assume that the number of nodes is 16 and that stations are indexed from 1 to 16. What is the *minimum* number of necessary slots (including: idle slots, collision slots and frame transmissions) if stations 7, 8, 15 and 16 have a frame to send? Present the exact sequence of slots and explain what happens in each slot.
6. Describe the congestion control algorithm used by TCP. Why is TCP under-performing in wireless environments?
7. Describe three problems that can arise in a Token Bus network that are handled by the Logical Ring Maintenance operations. Describe how the protocol handles each problem.
8. The efficiency of Ethernet (and CSMA/CD in general) depends on certain parameters. Indicate these parameters and explain how they impact the efficiency of CSMA/CD. Make sure you comment whether an increase in the value of a parameter results in a corresponding increase or decrease of efficiency.