ID Number:	Mark:
Last Name:	
First Name:	

CMPUT 313, Winter 2001, Midterm Examination (B1)

February 15th, 2001

This is an closed book exam. All questions have equal weights and must be answered in whatever space is available on this form. No additional sheets are allowed. To receive full marks present all intermediate steps. If necessary, state any additional assumptions that you made. The exam is marked out of 22 which is the percentage of its contribution to the final mark. All questions carry an equal weight. If you disagree with the mark received in this exam, you have two weeks from the day you are notified about your mark to contact the instructor and discuss your objection. Notification about your mark will be performed via e-mail to your ugrad.cs.ualberta.ca account.

[1] Consider the following two options: (a) the CRC remainder is appended after bit stuffing is performed to the frame (that is, the CRC remainder is calculated over the stuffed frame, the CRC remainder is then appended to the stuffed frame but no stuffing is performed to the CRC remainder), or, (b) the CRC remainder is calculated and appended to the frame before stuffing (that is, the CRC remainder is calculated over the frame, the CRC remainder is then appended to the frame, and finally the frame, with the CRC remainder appended, is stuffed). Compare the two options and determine which one is the best.

[2] How would you modify the Go-Back-N ARQ scheme if the FIFO delivery of frames over the link could not be guaranteed. In your answer consider both the version of Go-Back-N that uses NAKs as well as the version of Go-Back-N that does not use NAKs.

[3] Consider a cellular network where a special frequency is reserved for mobiles to request new connections. Access to this special frequency follows the ALOHA protocol. A connection request frame is exactly 125 bytes long. The transmission speed on the particular frequency is 100 kilobits/sec. What is the maximum number of successful connection requests per unit of time that can be supported by this system? (Assume that the only restriction in the system is from the number of successful requests, i.e., there are enough channels to support a connection after the connection request has been successfully transmitted.)
Pure ALOHA throughput: $S=Ge^{-2G}$

[4] Ethernet is a CSMA/CD 1-Persistent Truncated Binary Exponential Backoff medium access protocol. Assume we came up with a device, which when a collision occurs, it can indicate (to each station that attempted to transmit) how many stations collided in the particular collision (but *not* which ones). How could you modify the Ethernet protocol to take advantage of this device, and what problems would it solve?

[5] Consider the case of a shared medium, shared between 16 stations that use the Adaptive Tree Walk protocol. In the traversal of the tree, we avoid slots where the collision probability is larger than 0.5. If you know that the probability of a station to have a frame to send is 0.1, at which level of the tree do you start the traversal?

[6] Give an example of the problem encountered by Selective Reject with window size larger than half the set of sequence numbers available. Be thorough and exact in your example. Assume that the Selective Reject protocol is allowed to only send cumulative ACKs and NAKs (i.e., no "face value" (selective) ACKs are allowed).