York University COSC6117 January 14, 2002

Homework Exercise #1
Due: January 28, 2002

1. Throughout this exercise, all models are asynchronous (i.e. there are no bounds on process speeds or on the length of time required to deliver a message across a message channel). Also, there are no process failures. Your answers to both parts should be fairly brief, and need not be overly formal.

(a) Consider the following two models.

Model A: Unidirectional, reliable, FIFO channels. No bound on the size of individual messages.

Model B: Unidirectional channels. A channel may have message duplication errors (i.e. the same message can be delivered to the recipient more than once) and reordering errors (i.e. messages are not always delivered to the recipient in the same order as they were sent). No bound on the size of individual messages.

Suppose you have two message-passing systems with the same underlying network topology, one satsifying model A and one satisfying model B. Explain why they are equally powerful.

(b) Consider the following two models.

Model C: Bidirectional, reliable, FIFO channels. Each message sent is 4 bits long.

Model D: Bidirectional channels subject to duplication errors and message loss errors. However, each channel satisfies the "Eventual Delivery" property: Any message that is sent repeatedly across the channel is eventually delivered. More precisely, there is no (infinite) execution where the same message is sent an infinite number of times and never delivered to the recipient. There are no reordering errors. Each message is 4 bits long.

Suppose you have two message-passing systems with the same underlying network topology, one satsifying model C and one satisfying model D. Explain why they are equally powerful.