National University of Singapore
School of Computing

CS2105 **Problem Set 3** Semester 2 13/14

1. **(KR, Chapter 3, P8)** Draw the FSM for the receiver side of protocol `rdt3.0`.

2. **(KR, Chapter 3, P12)** The sender side of `rdt3.0` simply ignores (that is, take no action on) all received packets that are either in error or have the wrong value in the `acknum` field of an acknowledgement packet. Suppose that in such circumstances, `rdt3.0` were simply to retransmit the current data packet. Would the protocol still work? (*Hint*: Consider what would happen if there were only bit errors; there are no packet losses but premature timeouts can occur. Consider how many times the nth packet is sent).

3. **(Modified from KR, Chapter 3, P13)** Show that if the network connection between the sender and receiver can reorder messages (that is, that two messages propagating in the medium between the sender and receiver can be reordered), then `rdt3.0` will not work correctly.

4. **(KR, Chapter 3, P22)** Consider the GBN (Go-Back-N) protocol with a sender window size of 4 and a sequence number range of 1,024. Suppose that at time t, the next in-order packet that the receiver is expecting has a sequence number of k. Assume that the medium does not reorder messages. Answer the following questions:
   (a) What are the possible sets of sequence numbers inside the sender's window at time t? Justify your answer.
   (b) What are the possible values of the ACK field in all possible messages currently propagating back to the sender at time t? Justify your answer.

5. **(KR, Chapter 3, P23)** Consider the GBN and SR protocols. Suppose the sequence number space is of size k. What is the largest allowable sender window that will avoid the occurrence of problems such as that in Figure 3.27 for each of these protocols?