Assignment 2

1. (10pt.) What is the UDP checksum if the UDP packet consists of the following information: 1100110011001100 1011101110111011 1001100110011001.

   1100 1100 1100 1100 + 1011 1011 1011 1011 = 1 1000 1000 1000 0111

   Carry will be added back to the sum, hence 1000 1000 1000 1000

   1000 1000 1000 1000 + 1001 1001 1001 1001 = 1 0010 0010 0010 0001

   Again, add the carry back, hence 0010 0010 0010 0010

   Take the ones complement of it we have the checksum as 1101 1101 1101 1101

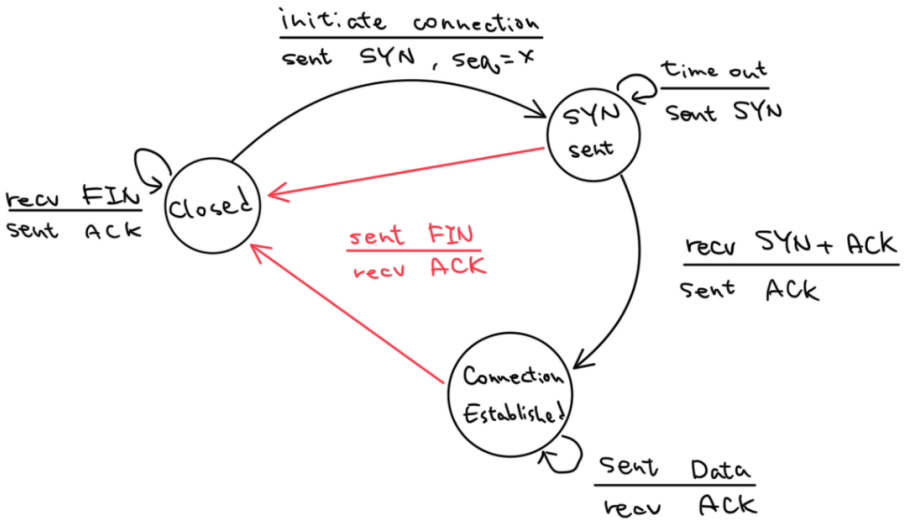
   -2 wrap around

   -2 wrong checksum

   -1 minor calculation error

   -5 no detail

2. (10pt.) Complete the finite state machine for 3-way handshaking on lecture Slide 21.



   -8 no FSM details

   -2 each incorrect state transition

3. (10 points) Assuming the current EstimatedRTT=0.2 sec. and DevRTT= 0.04 sec., during the current period you have measured SampleRTT= 0.3 sec., what will be the Timeoutinterval for the next period?

$$DevRTT = (1-\beta) * DevRTT + \beta * |SampleRTT - EstimatedRTT|$$
$$EstimatedRTT = (1-\alpha) * EstimatedRTT + \alpha * SampleRTT$$
$$TimeoutInterval = EstimatedRTT + 4 * DevRTT$$

DevRTT = 0.75 * 0.04 + 0.25 * |0.3 – 0.2| = 0.03 + 0.025 = 0.055

EstimatedRTT = 0.875 * 0.2 + 0.125 * 0.3 = 0.175 + 0.0375 = 0.2125

TimeoutInterval = 0.2125 + 4 * 0.055 = 0.4325

-5 no DevRTT

-8 applying DevRTT and EstimatedRTT directly

-1 each error

4. (10pt.) Suppose TCP Tahoe is used over a lossy link that loses one segment in every 6 th RTT (for example, starting from RTT #1, one segment will be lost during RTT #6, and the congestion window and threshold should be adjusted accordingly at RTT #6. The loss will repeat during RTT #12, RTT #18, …). Show how congestion window varies over time by filling in the following table. Assume that initially the congestion window is 2 segment and the threshold is 16. Also, while computing threshold, round it up to the nearest integer. To simply this question, we assume after a burst is sent, the sender will wait for ACKs to all the segments before the congestion window is adjusted. In addition, we assume the ACKs will return to the sender every RTT time, if not lost.

RTT #	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
cwnd	2	4	8	16	17	1	2	4	8	9	10	1	2	4	5	6
ssthresh	16	16	16	16	16	9	9	9	9	9	9	5	5	5	5	5
RTT #	17	18	19	20	21	22	23	24	25	26	27	28	29	30		
cwnd	7	1	2	4	5	6	7	1	2	4	5	6	7	1		
ssthresh	5	4	4	4	4	4	4	4	4	4	4	4	4	4		

-2 if not changed at 6, 12, 18, 24

-2 for rounded up/down

-2 if go over the threshold when doubling

-1 minor error

5. (10 points) In sliding window scheme, if the total number of possible sequence number is 32, what are the largest possible sizes of sender's window for Go-Back-N and Selective-Repeat respectively?

   For Go-Back-N, the maximum window size is 32 – 1 = 31

   For Selective-Repeat, the maximum window size is 32 / 2 = 16

   -5 for each incorrect answer without explanation

   -5 if calculating with 2^n for n = 6 or 32

   -2 for each incorrect answer