Assignment #8

Due 03/30/2021

1. (**5 points**)
   What is the HDLC bit stuffed output bit pattern for the following input bit pattern?

   111001011111001111111001110111100111111111100011011111

   A 0 is stuffed for every 5 consecutive '1s'

   1110010111110<u>0</u>0011111<u>0</u>1100111011110011111<u>0</u>11111<u>0</u>000110111110

1. **(15 points)**
   What is the Hamming distance of the code with the following codewords?

   000000
   001101
   110100
   111111
   101010
   110011

   HD(000000,001101) = 4
   HD(000000,110100) = 3
   HD(000000,111111) = 6
   HD(000000,101010) = 3
   HD(000000,110011) = 4

   HD(001101,110100) = 4
   HD(001101,111111) = 3
   HD(001101,101010) = 4
   HD(001101,110011) = 5

   HD(110100,111111) = 3
   HD(110100,101010) = 4
   HD(110100,110011) = 3

   HD(111111,101010) = 3
   HD(111111,110011) = 2

   HD(101010,110011) = 3

2. (**15 points**)
   Assume 4000 bytes long IP packet/datagram is to be transmitted over a link with 1600 bytes link MTU. Show all the relevant field values for the original IP packet/datagram and each of its packet/datagram fragment.

4000 Byte Diagram
MTU = 1600 Bytes
Assuming IP Header = 20 Bytes
4000 – 20 = 3980 Bytes of Data left
Assume ID of original packet = x
1600 – 20 = 1580 Bytes may be transmitted in each packet
# of packets = Ceiling (3980/1580) = 3 packets needed

Length	ID	MF(Frag Flag)	Offset
1596	x	1	0
1595	x	1	197
848	x	0	394

3. (**15 points**) HDLC time sequence diagram below shows communication between sender A and receiver B. The sender (receiver) is transmitting data (acknowledge) frame. The data frame and acknowledge frame carry sequence number N and represented by FRM N and ACK N respectively. Assuming 4-bit sequence numbers and first data frame transmitted by A carrying sequence number 0 (FRM 0), (a) display on the time diagram each data frame (FRM N) transmitted by sender A and each acknowledgement frame (ACK N) transmitted by receiver B, (b) use data frame loss error recovery by Selective Repeat ARQ. Note that third data frame transmitted by A is not received by B.