John F. Lake, Jr.
Computer Networks
Homework #2

1. 11010111110010111110101011111**0**110
    a. The bolded bits are the bits with 0s stuffed at the end.

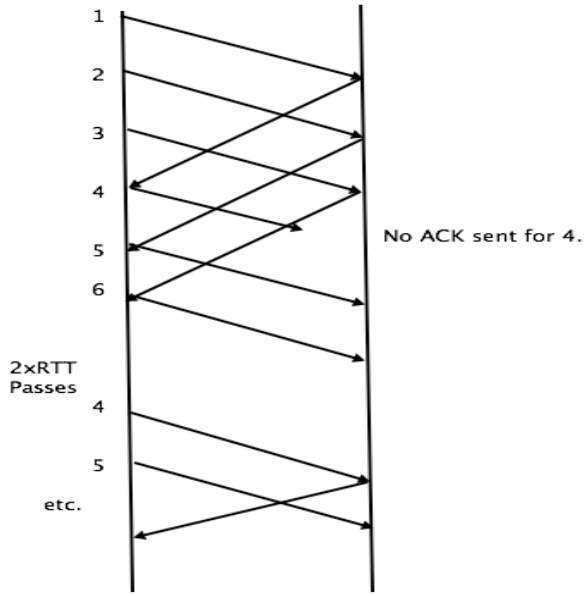
2. Values of parity bits for hex values:
    a. 0x48: 01001000 **(Even no. of 1s; Parity bit: 1)**
    b. 0x2A: 00101001 **(Odd no. of 1s; Parity bit: 0)**
    c. 0x78: 01111000 **(Even no. of 1s; Parity bit: 1)**

3. Message: 11100011; Polynomial: x^3 + 1 (1001)
    a. Divide 11100011000 by 1001. R: 100
    b. Append remainder to original message.
        i. Final Message: **11100011100**

4. Bandwidth = 1 Mbps = 1000000 bits per second.
    a. Latency = 1.25 seconds.
    b. RTT = 2.5 seconds.
    c. DBP = 2.5 Mb = 2500000 bits.
    d. Each frame = 1 KB = 8000 bits.
    e. 2500000/8000 = 312.5 = 312 frames.
    f. **We need 9 bits to accommodate this many frames uniquely.**

5. If you implemented the flow control this way, you might get repeated frames sent over and over again. The sender has a timer associated with each frame it sends, and if the sender doesn't get an ACK before the timer expires, it will send the same frame again. If you delayed the ACK for any reason, it would cause timeouts and repeated frames being sent.

6. Pictures:
    a. Frame 4 is lost, so after 2 RTTs it is resent and the sequence continues as normal:



    b. Frames 4,5, and 6 are lost. 2 RTTs after 4 is lost they are sent again with no problem.