Quiz 1

1. NRZ: Yes, since its based on actual voltage levels
   NRZI: No, since its based on transitions
   Manchester: Yes, since its again based on voltage levels (note there are transitions also, but 0 is actually a transition from low voltage to high voltage)
   4B/5B: No since its based on NRZI.
2. Doesn't work. Consider the input data 0111111111110 (zero followed by 11 ones and then a zero). When we stuff this data it will be 01111101111110 (notice we don't stuff a zero after the second set of five ones as the zero is a stuffed zero). The receiver will interpret the last 8 bits of the data as the flag.
3. According to Nyquist, fp <=2Blog_2M i.e fp <= 2 * 8 * log_2(4) = 32 kbps
4. No errors based on polynomial division, 01001010 is the message (4 redundant bits since degree is 4)
5. a. Tx time A -B: 1000 * 8 / 40 = 200ms; Tx time: B-A: 100 * 8 / 80 = 10ms; total propagation delay: 120+70 = 190ms. In 400ms total, 1000 bytes transferred. So, throughput is 1000 * 8 / 400 kbps = 20kbps
   b. Bandwidth delay product = 40kbps * 400ms = 16000 bits = 2000 bytes = 2 packets
   c. 40kbps since you are sending a window size of packets to begin with and another packet for every ack received, The link is continuously busy.
   d. 8kbps. The window can only advance once per 1000 msec (tx time of the ack), since that's the minimum spacing between two acknowledgments. Therefore A can only send one data packet per second i.e.8000 bits per second i.e. 8kbps, nowhere close to 40kbps. So, stark asymmetry can affect sliding window protocols negatively.