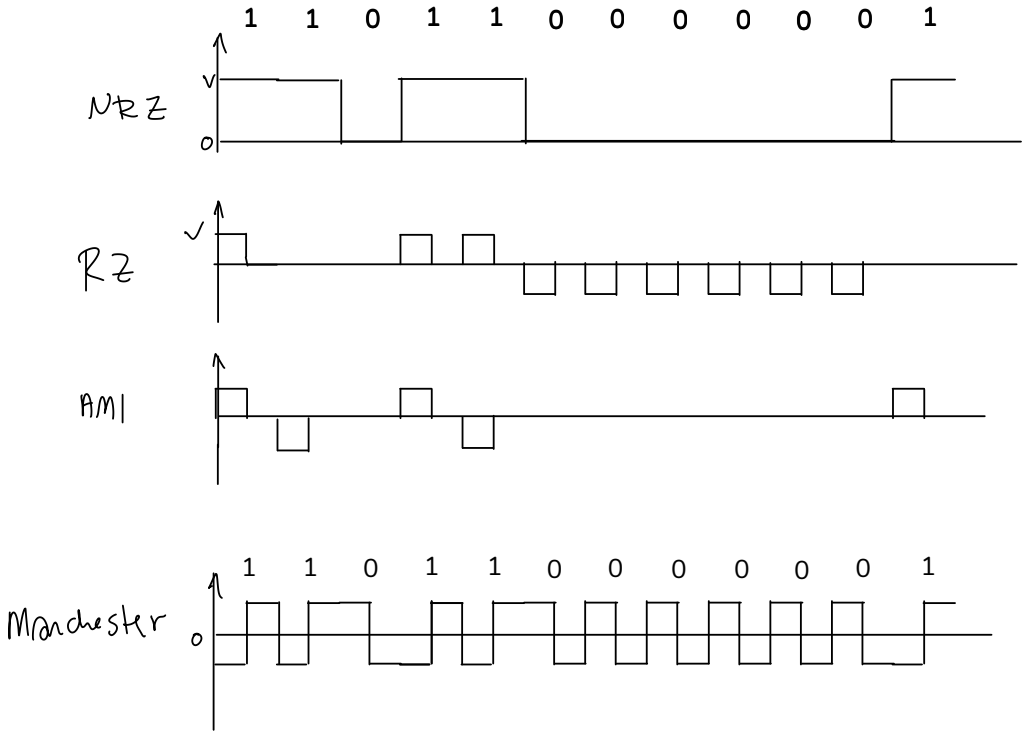
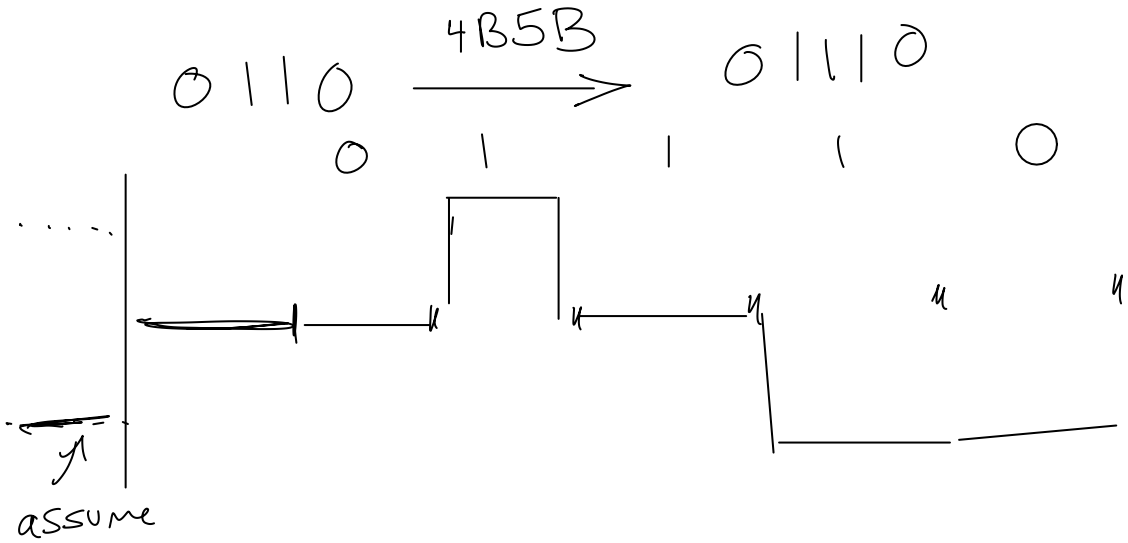
Exercise 1: Encode the bit sequence 1101 1000 0001 using NRZ, RZ, AMI and Manchester line codes described below.



Exercise 2: How would the bit sequence 0110 be encoded using 4B5B followed by MLT3 assuming the starting level is 0V?

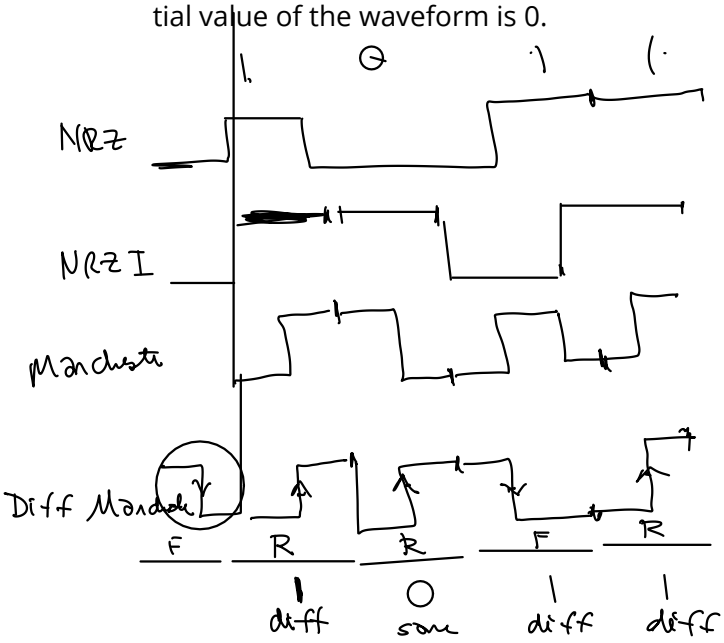


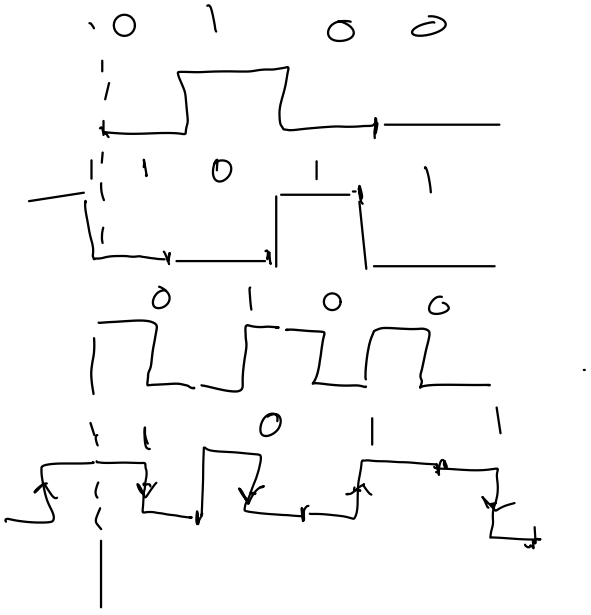
Exercise 3: Why? first error - due to noise

second error - due to differential coding & first error

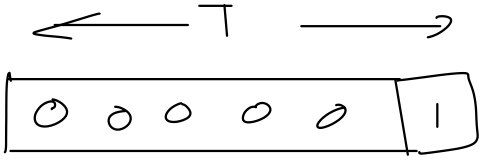
1 = change
0 = no change

Exercise 4: Encode the bit sequence 1011 using NRZ, NRZI and Manchester. Invert the waveforms. Decode them. Assume the initial value of the waveform is 0.



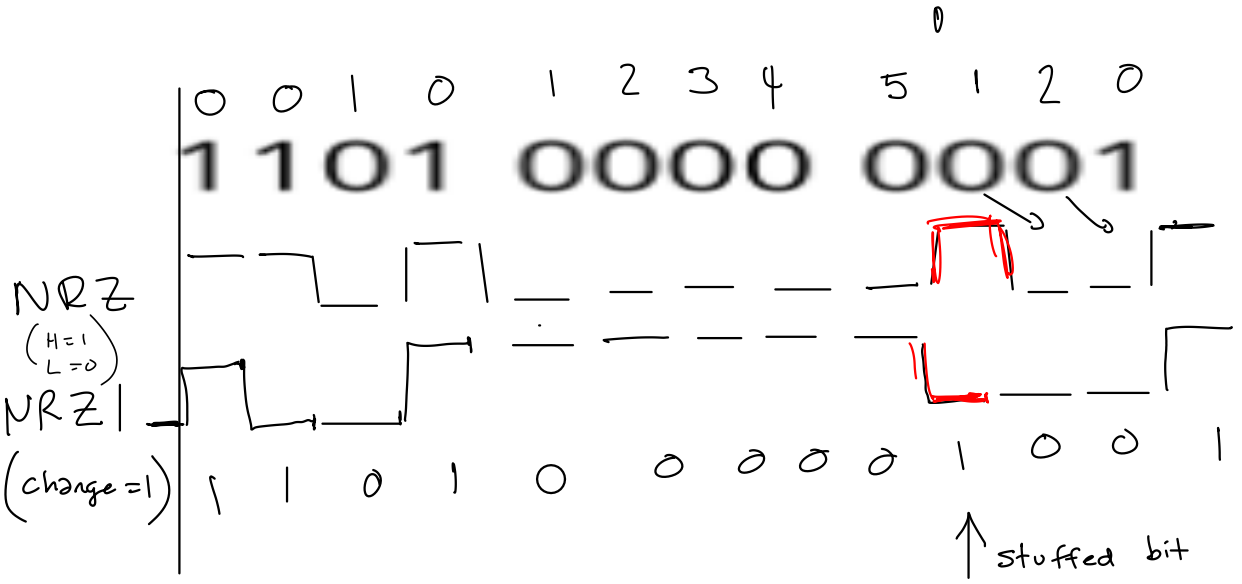


Exercise 5: What is worst-case increase in bit rate? → when transmit constant 0's

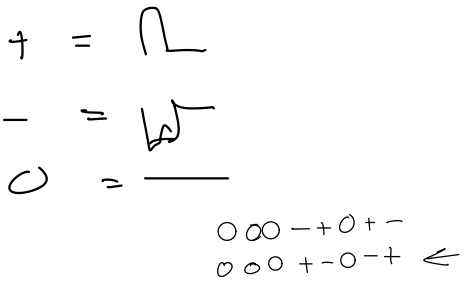


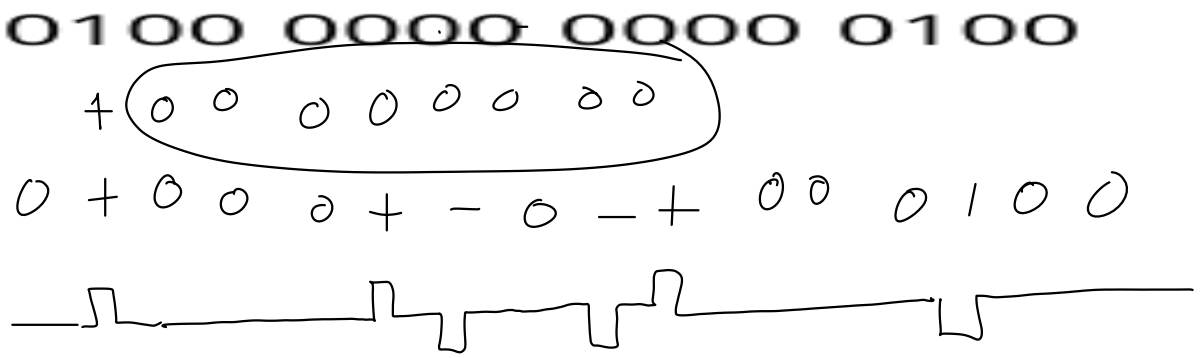
$$\frac{6 \text{ bits}}{T} \Big/ \frac{5 \text{ bits}}{T} = 20\% \text{ faster}$$

Exercise 6: Encode the bit sequence 1101 0000 0001 using NRZI with bit-stuffing after 5 zero bits.



Exercise 7: Convert the sequence 0100 0000 0000 0100 to a B8ZS waveform assuming the first 1 is transmitted as a positive pulse.





Exercise 8: Show the binary and Gray-coded encodings for PAM4. What is the average number of bits in error in each case if the only errors are between adjacent levels?