

4 . In the following signal encoding technique, binary data are presented as input,

$$a_m = 1, 2, 3, \dots$$

During the encoding process, two levels of processing occur:

First, a new set of binary digit b_m are generated as follows:

$$b_m = (a_m + b_{m-1}) \bmod 2$$

These digits are then encoded as:

$$c_m = b_m - b_{m-1}$$

On the receiver side, the original data is recovered by:

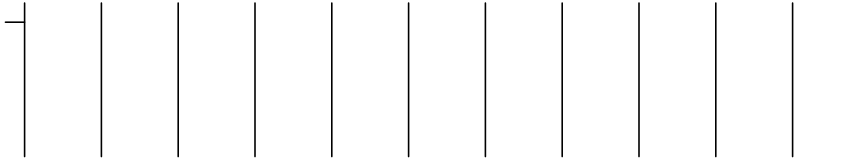
$$a_m = c_m \bmod 2$$

- a. Verify that the received values of a_m equal the sent values of a_m . (9 pts.)
- b. Show the corresponding bit stream of c_m for the following source bit sequence. Show work. (9 pts.)

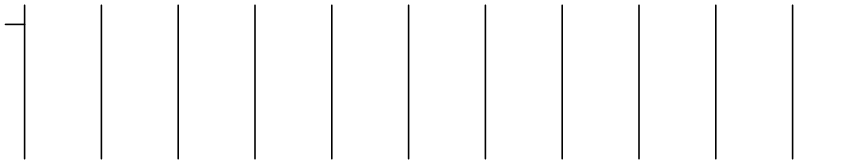
1 0 1 1 0 1 0 1 1 0

5. For the bit stream 1 0 0 0 0 0 0 0 0 1, sketch the waveforms for each of the following code: (8 pts. Each)

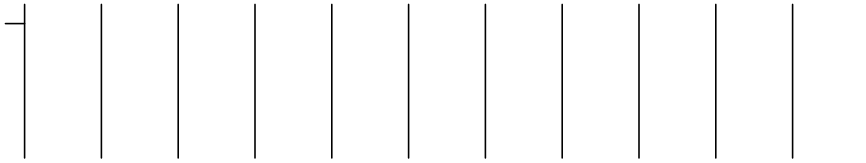
a. Manchester



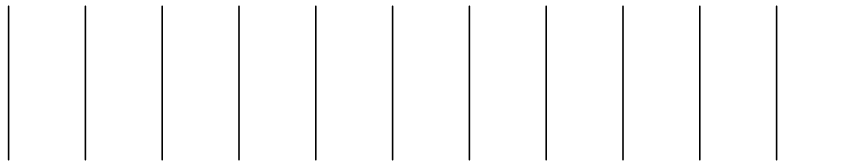
b. Pseudoternary



c. B8ZS



6. Complete the waveform for the bit stream 1 0 0 0 1 1 1 1 0 0, based on the following formular: (8 pts.)



$$s(t) = \begin{cases} A \cos(2\mathbf{p}f_c t + \mathbf{p} / 2) & \text{for binary 0} \\ A \cos(2\mathbf{p}f_c t + \mathbf{p}) & \text{for binary 1} \end{cases}$$