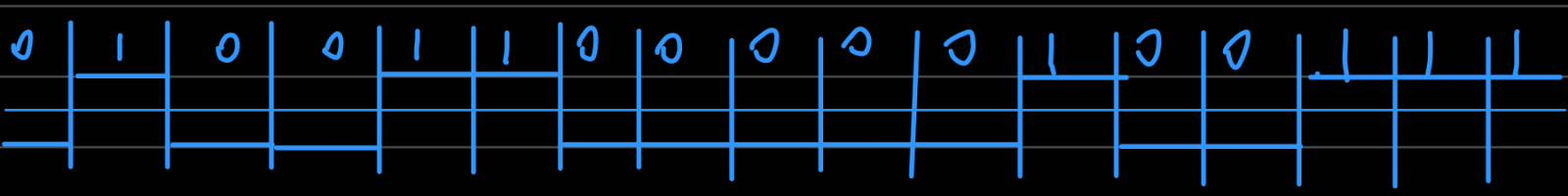
1、 Given the digital code element sequence of 10 0101000001100001101, please write down the c orresponding AMI code and HDB3 code sequence s.

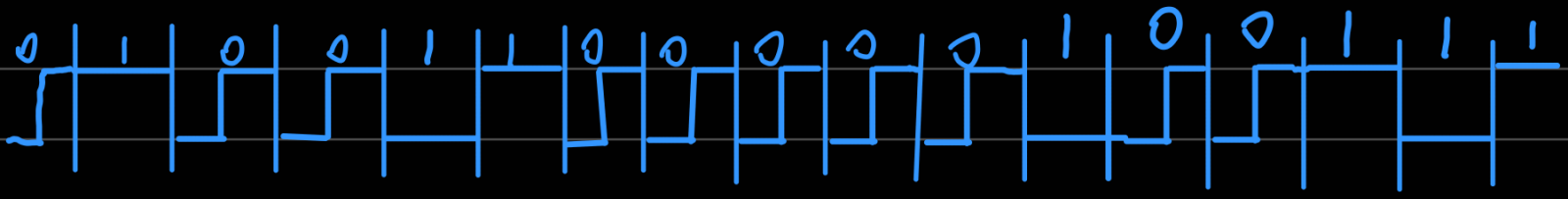
The AMI code is: +00-0+0000-+0000-+0-

The HDB3 code is: B+00B-0B+000V+00B-B+ B-00V-0B+B-0B+

2、
Given the binary digital sequence of 0100110000100111, please draw the corresponding waveforms for bipolar NRZ code, CMI code, and conditional biphase code.

NRZ:





3、 Briefly explain the purpose of code type transformation and the costs that need to be incurred.

To improve the reliability of communication, but at the expense of system bandwidth.

4、 Under the condition of equal probability, please write down the optimal decision threshold for the bipolar system and the unipolar system.

For the bipolar system situation:
The given signal level: $+A$, $-A$.
The optimal decision threshold T for the bipolar system is: $T = \frac{+A+(-A)}{2} = 0$.

For the unbipolar system situation:
The given signal level: $+A$, 0
The optimal decision threshold T for the unbipolar system is: $T = \frac{+A+0}{2} = \frac{A}{2}$.

5、 Tell formulas of the Nyquist bandwidth, Nyquist rate, and the highest band utilization of non-ISI baseband system.

5.1 The Nyquist bandwidth B refers to the minimum bandwidth required to transmit a signal without intersymbol interference.

For the baseband system, the Nyquist bandwidth is given by: $B = \frac{R_b}{2}$

(R_b is the bit rate).

5.2 The Nyquist rate f_N is the minimum sampling rate required to avoid aliasing, which is twice the maximum frequency of the signal:

$f_N = 2B = R_b$.

5.3 The highest band utilization or the maximum spectral efficiency of a non-ISI baseband system is defined as the ratio of the bit rate.

The band utilization $= \frac{R_b}{B}$

$\because B = \frac{R_b}{2}$ (for a non-ISI baseband system).

$\therefore$ the spectral efficiency $= \frac{R_b}{\frac{R_b}{2}} = 2$ bits/s/Hz.

6、 Please write down the concept of Inter-Symbol Interference (ISI), the conditions (formulas) without ISI, and the meaning behind it.

ISI refers to the interference between adjacent symbols, which may cause the receiving end to be unable to correctly recognize the transmitted symbols.

The condition for zero ISI: under ideal conditions, the frequency response of the transmission channel should be an ideal square pulse response, without generating

any inter symbol interference.