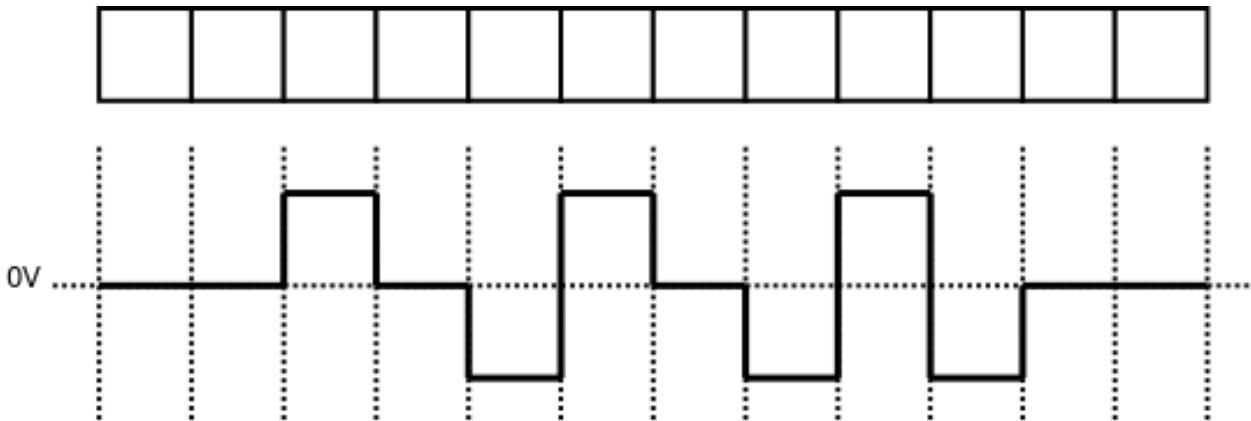


ITS323 – Midterm Examples

Midterm Exam 2009, Question 1(b)

The Pseudoternary digital encoding scheme alternates between positive and negative voltage levels between successive bit 0's, and uses zero voltage for bit 1. Write the received bits in the boxes for the following received digital signal. [3 marks]



Midterm Exam 2009, Question 2

Consider a point-to-point wireless communications system using two parabolic antennas:

- Transmit antenna diameter: 1 metre
- Receive antenna gain: 20dBi
- Signal frequency: 3GHz
- Distance between transmitter and receiver: 10km
- Receive power threshold: -80dBm

Assuming free space path loss, what is the minimum transmit power required? [6 marks]

In the free space path loss model, the absolute path loss (L) between the two antenna's can be written as:

$$L = \frac{(4\pi d)^2}{\lambda^2}$$

However, the free space path loss model does not consider obstructions or other environmental factors. Assume you have measured the real path loss between the two antennas to be $L_{dB} = 130$ dB. Using the measured path loss (instead of free space path loss), what is the minimum transmit power required? [5 marks]

Midterm Exam 2009, Question 1(c,d)

The following data is to be sent using a combination of FSK and ASK. There are 2 possible frequencies and 4 possible amplitudes.

010101001001010110110111

Select and describe a mapping of bits to signals (sinusoids) that uses all possible combinations of frequencies and amplitudes. Using the mapping you selected, draw the analog signal to be transmitted. [6 marks]

Midterm Exam 2009, Question 4(a,c)

Table 1 shows the list of codewords for a Hamming-distance based Forward Error Correction (FEC) scheme.

Data	Codeword
000	011011
001	100110
010	100111
011	010000
100	111100
101	001010
110	100101
111	001011

Table 1: Hamming-based FEC

For the following cases, explain the steps taken by the receiver (showing any calculations where necessary).

1. The data 010 is to be sent from transmitter to receiver. The 1st bit transmitted is in error (that is, the 1st bit transmitted is different from the 1st bit received).
2. The data 100 is to be sent from transmitter to receiver. The 1st and 2nd bits transmitted are in error.
3. The data 001 is to be sent from transmitter to receiver. The last bit transmitted is in error.

If using a link with data rate of 12Mb/s, what is the maximum possible throughput using the encoding scheme in Table 1? [2 marks]