COSC 264 Problem Set
Physical Layer

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1 Questions

Problem 1.1 (Baseband modulation/encoding)**.**

We are given the data bit sequence 1011 0001.

1. Draw the unipolar-NRZ-encoded signal for the given data sequence.
2. Draw the Manchester-encoded signal for the given data sequence.

Do not forget axis labels.

Problem 1.2 (Passband modulation/encoding)**.**

We are given the data bit sequence 0100 1101. Draw the waveforms of this sequence for the following passband modulation schemes.

1. ASK: Assume $f_c = 4\pi$, $T = 1$, $A_0 = 0$ and $A_1 = 1$.
2. FSK: Assume $f_c = 4\pi$, $T = 1$, $f_0 = 0$ and $f_1 = 8\pi$.
3. PSK: Assume $f_c = 2\pi$, $T = 1$, $\phi_0 = 0$ and $\phi_1 = \pi$.

Do not forget axis labels.

Problem 1.3 (Natural numbers and Decibel numbers)**.**

1. We have discussed how to convert "normal" numbers η into their Decibel (dB) value η_{DB}:

   $$\eta_{DB} = 10 \cdot \log_{10} \eta$$

   Please give the formula for converting dB values back to normal values and use this to:

   a) express 95 dB as a normal value

   b) express -95 dB as a normal value

2. According to `https://en.wikipedia.org/wiki/Optical_fiber` an optical fiber has a signal attenuation of as little as 0.2 dB per kilometer. Approximately how many kilometers long is an optical cable that loses half the signal power?