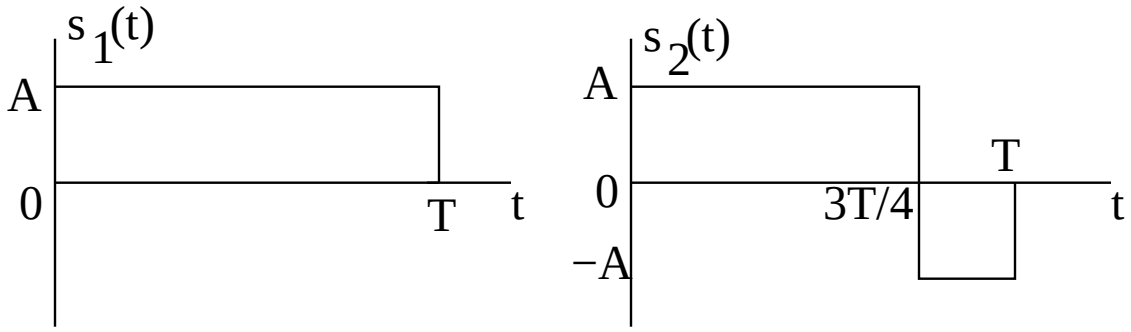
Quiz 1 for EE419

Time limit: 50 minutes

Sep 1, 2008

1. (4 marks) A binary communication system uses the two waveforms shown below for signalling. Sketch a signal constellation representation of the signals.



2. (4 marks) A 4 kHz bandpass channel is to be used for transmission of data at a rate of 9600 bps. Design a QAM modulation using a signal pulse with a raised-cosine spectrum having a roll-off factor of at least 0.5.

3. (8 marks) A digital transmitter uses QPSK to encode independent bits (b_0, b_1) into symbols (choose any mapper). The receiver knows that $\Pr\{b_0 = 0\}$=1/3, $\Pr\{b_1 = 0\}$=3/5 *a priori*. Supposing (x, y) is received across an AWGN channel, find $\Pr\{b_1 = 0|(x, y)\}/\Pr\{b_1 = 1|(x, y)\}$.

4. (9 marks) A digital transmitter uses the 4-PAM constellation {-3,-1,1,3} over a channel that either rotates the constellation (in two dimensions) 90 degrees anti-clockwise with probability 1/2 or leaves it unrotated with probability 1/2. White Gaussian noise is added in both dimensions. Draw the received constellation and the optimal decision regions.