Birzeit University
Faculty of Engineering
Department of Electrical Engineering
Modern Communication Systems ENEE3306
Second Quiz
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Problem 1:
A digital communication signaling scheme employs the two signals $s_1(t)$ and $-s_1(t)$ to transmit binary digits 1 and 0, respectively, over a channel corrupted by AWGN with zero mean and power spectral density $N_0/2$. Let P(1) = P(0) = 1/2 and let $s_1(t)$ be defined as:

$$s_1(t) = \begin{cases} A & 0 \le t \le T_b / 2 \\ -A & T_b / 2 \le t \le T_b \end{cases}$$

a. Sketch h((t), the impulse response of the matched filter.
b. Find the average probability of error of the optimum receiver.
c. If $s_1(t)$ is applied to the input of the matched filter at t = 0, find the filter output at $t = T_b$

Problem 2:
Consider a binary FSK modulator which transmits one of the following signals to represent digits 1 and 0, respectively

$$s_1(t) = A\cos(2\pi f_1 t) \quad 0 \le t \le T_b$$
$$s_2(t) = A\cos(2\pi f_2 t) \quad 0 \le t \le T_b$$

Consider also the binary PSK modulator which transmits one of the following signals to represent digits 1 and 0, respectively

$$s_1(t) = \mathrm{B}\cos(2\pi f_c t) \quad 0 \le t \le T_b$$
$$s_2(t) = -\mathrm{B}\cos(2\pi f_c t) \quad 0 \le t \le T_b$$

Find the relationship between A and B such that the two systems have the same probability of error.

Good Luck