EC3850
Name: KEY

7 April 1999
QUIZ 1

A sine wave is to be used for an FSK signalling scheme. The duration of the signal element (and hence the bit period in this case) is 10^{-5}. The received signal is of the following form:

$$s(t) = 0.01 \sin[2\pi(f_c \pm \Delta f)t]$$

where $\Delta f = 200KHz$ and $f = 1MHz$. If the measured noise power at the receiver is 5×10^{-8} watts and the raised-cosine rolloff factor is 0.5, determine the E_b/N_o (in dB) in each case. (Hint - Recall that R is related to the bit period).

$T_s = T_b = \frac{1}{R} = 10^{-5}$ sec/bit

Signal Power $= \frac{A^2}{2} = 5(10)^{-5}$

$SNR = \frac{5(10)^{-5}}{5(10)^{-8}} = 1000$

For FSK: $B_T = 2\Delta f + (1+r)R = 2(10)^5 2 + 1.5(10)^5$

$\Rightarrow \frac{E_b}{N_o} = SNR \frac{B_T}{R} = 1000 \left(\frac{5.5(10)^5}{10^5} \right) = 5500$

$\Rightarrow \left(\frac{E_b}{N_o}\right)_{dB} = 37.4 dB$

Note: For PSK: $\frac{E_b}{N_o}_{dB} = 31.7 dB$

For QPSK: $\frac{E_b}{N_o}_{dB} = 28.7 dB$