Homework #4

Written: Not Due
Programming: Dec. 5, 2019
Please show all work in order to get full credit.

Optional Problems: #6.6, 6.13, 6.17(a), 6.18, 6.26, 6.34

Matlab Problems:

M1) Using the message signal $m(t) = 3\sin \pi t + 2\cos 2\pi t + \sin 4\pi t$, a PM signal $x_c(t) = 3\cos\left(100\pi t + \beta m(t)\right)$ is generated.

(a) Plot $m(t)$ and $x_c(t)$ for $\beta = 0.5$, 5 and 15.

(b) Plot the spectrum of $m(t)$ and $x_c(t)$ for $\beta = 0.5, 5$, and 15.

M2) Using the same $m(t)$ in M1, a FM signal $x_c(t) = 3\cos\left(100\pi t + 2\pi f_d \int_\alpha m(\alpha)d\alpha\right)$ is generated.

(a) Plot $m(t)$ and $x_c(t)$ for $f_d = 0.5, 5$, and 15.

(b) Plot the spectrum of $m(t)$ and $x_c(t)$ for $f_d = 0.5, 5$, and 15.

M3) Assume

$$x_t(t) = A_c\cos(150\pi t) + A_i\cos(150\pi t + 30\pi t),$$

with $A_c = 100$, is sent into an ideal discriminator. Plot the instantaneous phase deviation $\psi(t)$ and the output $y_D(t)$ of the ideal discriminator for

(a) $A_i = 0.1A_c$.

(b) $A_i = 0.95A_c$.

(c) $A_i = 1.15A_c$.