



Figure 13: Problem 18d

19.

$$\int_0^T 2 \cos(2\pi f_i t) \cos(2\pi f_j t) dt = 0 \Rightarrow \underbrace{\int_0^T 2 \cos(2\pi(f_i + f_j)t) dt}_A + \underbrace{\int_0^T 2 \cos(2\pi(f_i - f_j)t) dt}_B$$

$A \rightarrow 0$, as $f_i + f_j \gg 1$

$B = \sin(2\pi(f_i - f_j)T)$ is 0 first time for $2\pi(f_i - f_j)T = \pm\pi \Rightarrow |f_i - f_j| = 0.5T$

MATLAB CODE

```
gamma_dB = [0:.01:60];
gamma = 10.^(gamma_dB/10);

vBdT = .01;
x = 2*pi*vBdT;
rho_C = besselj(0,x);
Pb_bar=.5*((1+gamma*(1-rho_C))./(1+gamma));
semilogy(gamma_dB,Pb_bar);

hold on;
vBdT = .001;
x = 2*pi*vBdT;
rho_C = besselj(0,x);
Pb_bar=.5*((1+gamma*(1-rho_C))./(1+gamma));
semilogy(gamma_dB,Pb_bar,'b-');

vBdT = .0001;
x = 2*pi*vBdT;
rho_C = besselj(0,x);
Pb_bar=.5*((1+gamma*(1-rho_C))./(1+gamma));
semilogy(gamma_dB,Pb_bar,'b--');
```

20.

$$p(kT) = \left\{ \begin{array}{ll} p_0 = p(0) & k = 0 \\ 0 & k \neq 0 \end{array} \right\} \dots (a)$$

Goldsmith Solution Manual

Jiyuan Zhang



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