

**Q1)** Let the input to the system shown in Fig Q1, to be  
 $x(t) = 4 + 12 \cos^2(\pi f_0 t) + 8 \sin(2\pi f_0 t) + 10 \sin(4\pi f_0 t)$ , and the transfer function  
 $H(f) = \begin{cases} 1/5 & -1.5f_0 < f < 1.5f_0 \\ 0 & \text{otherwise} \end{cases}$

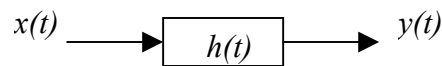


Fig Q1

- a) Find and Plot the frequency spectra (amplitude & phase) for the input and the output.
- b) Find and plot the power spectral density for the input  $G_i(f)$ , and the output  $G_o(f)$ .
- c) Find the normalized input power  $S_i$ , and the normalized output power  $S_o$ .
- d) Find the power gain in dB.

**Q2)** A signal  $x(t)$  is applied to the system shown in Fig Q2 with a power spectral density PSD  $G_i(f) = 3 \quad -1 < f < 1$ .

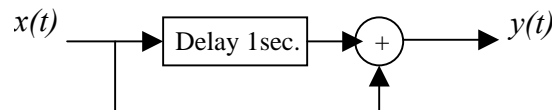


Fig Q2

- a) Plot the input PSD  $G_i(f)$ .
- b) Find the normalized input power  $S_i$ .
- c) Find and plot PSD for the output  $G_o(f)$ .
- d) Find the normalized output power  $S_o$ .
- e) Find the power gain in dB.