EE2023 Mid-term Quiz: AY2019-2020 Semester 2

Q1(a). $x(t) = 4\,\mathrm{rect}\left(\frac{t}{4}\right) - 4\,\mathrm{tri}\left(\frac{t}{2}\right) + 6\,\mathrm{tri}\left(t\right)$

Q1(b). $X(f) = 16\,\mathrm{sinc}(4f) - 8\,\mathrm{sinc}^2(2f) + 6\,\mathrm{sinc}^2(f)$

Q1(c). $x_p(t) = x(t) \otimes \sum_{k=-\infty}^{\infty} \delta(t - k5)$

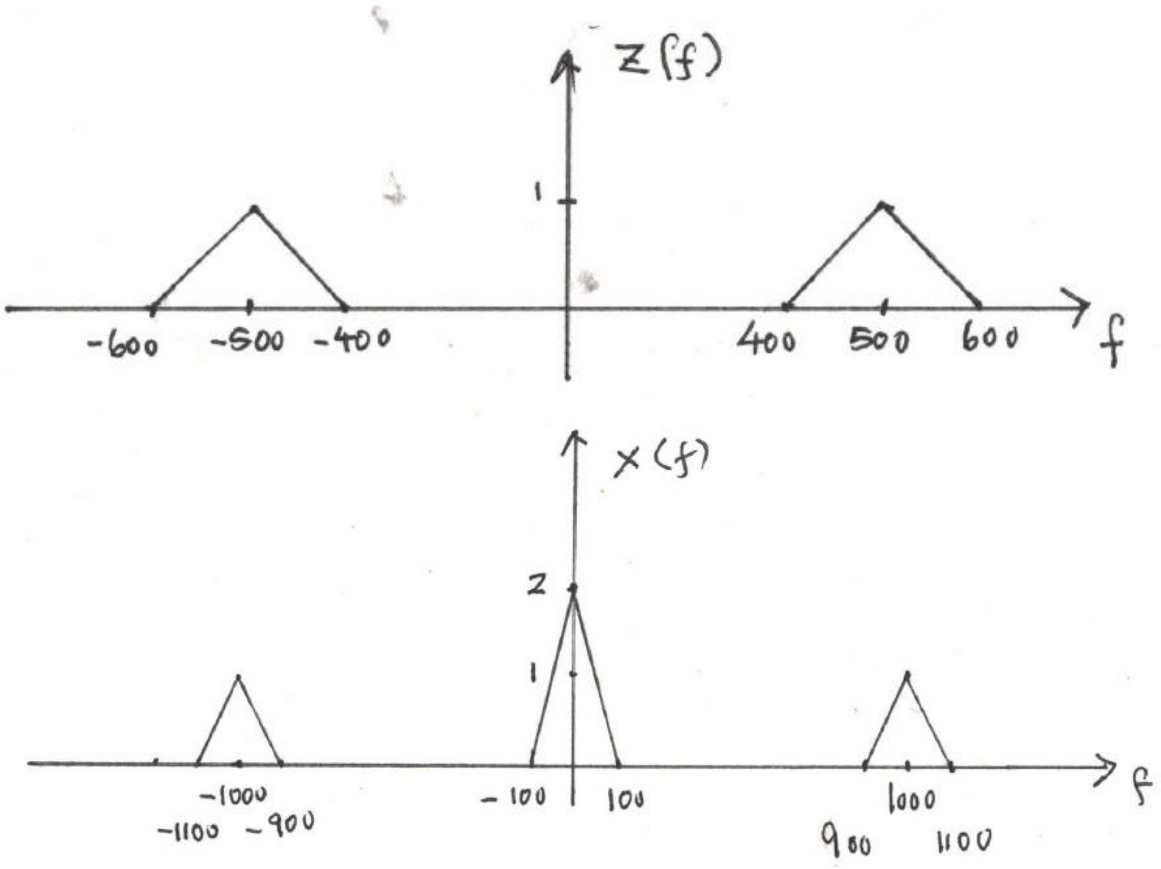
Q1(d). $X_p(f) = \frac{1}{5}\sum_{k=-\infty}^{\infty}\left[16\,\mathrm{sinc}(\frac{4k}{5}) - 8\,\mathrm{sinc}^2(\frac{2k}{5}) + 6\,\mathrm{sinc}^2(\frac{k}{5})\right]\delta\left(f - \frac{k}{5}\right)$

Q2(a). Fundamental frequency = 50Hz ; Period = 1/50 = 0.02 seconds

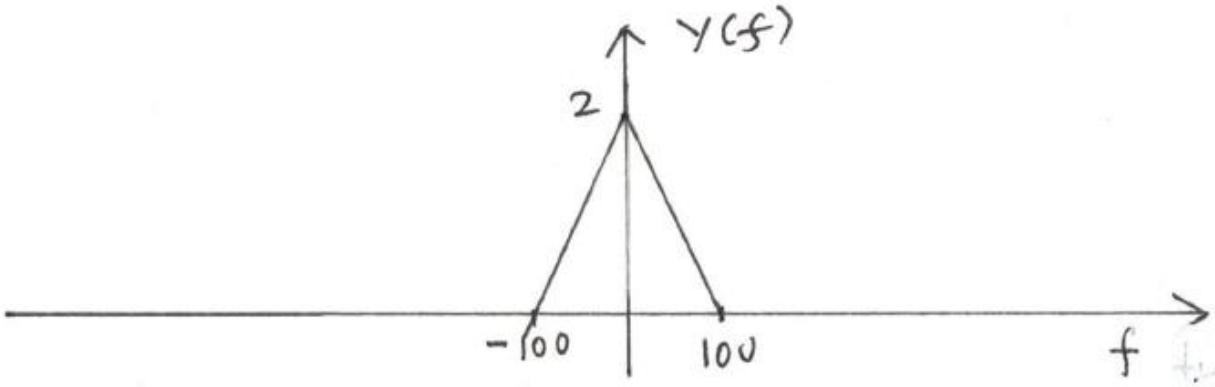
Q2(b). $c_{-5} = 4e^{j\pi/4}$; $c_5 = 4e^{j\pi/3}$; $c_{-2} = 7e^{-j\pi/3}$; $c_2 = 7e^{j\pi/3}$; $c_0 = 10$

Q2(c). Average power = 230

Q3(a).



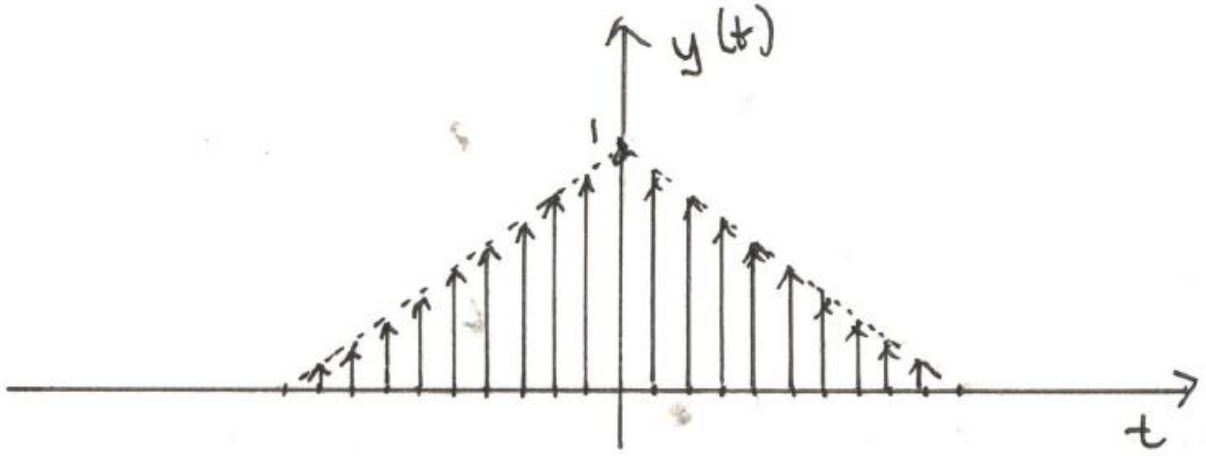
Q3(b).



$m(t)$ can be recovered from$y(t)$ with a low pass filter that has a cutoff frequency of 100Hz.

Q4(a). $X(f) = 10\,\mathrm{sinc}^2(10f)$; 1st null bandwidth is 0.5Hz.

Q4(b).



Q4(c).