EE2023 Signals and Systems Mid-term Quiz – AY2017/2018 Semester 2

Q1(a) $f_0 = \frac{3}{2}$; $T_0 = \frac{2}{3}$

Q1(b) $c_2 = 2$; $c_{-2} = 2$; $c_3 = 7$; $c_5 = 1.5e^{-j\pi/6}$; $c_{-5} = 1.5e^{j\pi/6}$

Q1(c)

$$X(f) = 2\delta\left(f - \frac{3}{2}\right) + 2\delta\left(f + \frac{3}{2}\right) + 7\delta\left(f - \frac{9}{2}\right) + \frac{3}{2}e^{-j\pi/6}\delta\left(f - \frac{15}{2}\right) + \frac{3}{2}e^{j\pi/6}\delta\left(f + \frac{15}{2}\right)$$

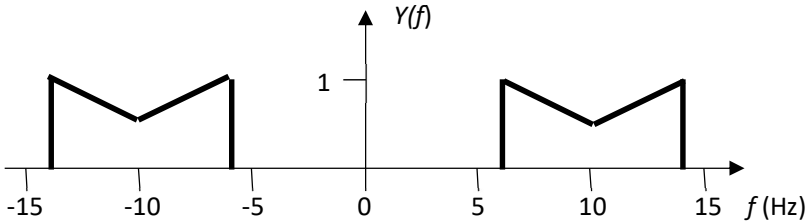
Q1(d) Average power = 61.5

Q2(a) $X(f) = 2\,\mathrm{sinc}(2f)e^{j2\pi f} - \mathrm{sinc}^2(f)e^{-j2\pi f}$

Q2(b) $x_p(t) = x(t) \otimes \sum_{k=-\infty}^{\infty} \delta(t - k5)$

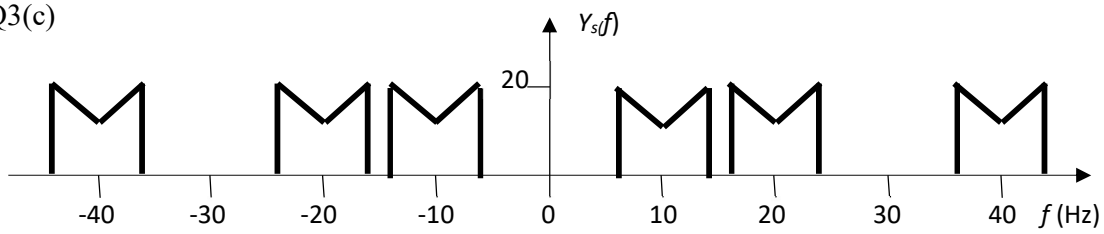
Q2(c) $X_p(f) = \sum_{k=-\infty}^{\infty} \frac{1}{5}\left[2\,\mathrm{sinc}\left(2\frac{k}{5}\right)e^{j2\pi k/5} - \mathrm{sinc}^2\left(\frac{k}{5}\right)e^{-j2\pi k/5}\right]\delta\left(f - \frac{k}{5}\right)$

Q3(a)



Q3(b) $y_s(t) = y(t).\sum_{k=-\infty}^{\infty} \delta\left(t - \frac{k}{30}\right)$

Q3(c)



Q4(a) $Y(f) = 32\,\text{sinc}^4\left(2f\right)e^{-j6\pi f}$

Ist null occurs at $f = 0.5$ Hz.

Q4(b) Maximum value occurs at t = 3 seconds.