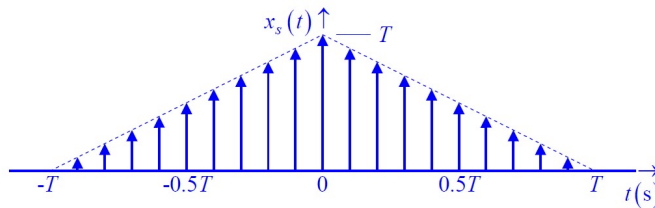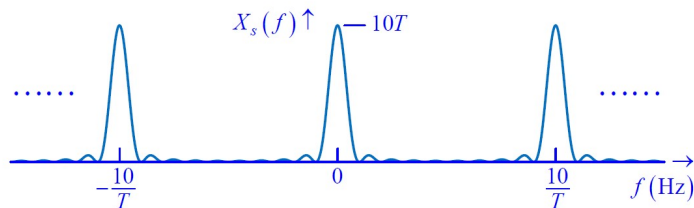**EE2023 Signals and Systems Mid-term Quiz – AY2014/2015 Semester 2**

Q1(a). $x_s(t) = \sum_k T \operatorname{tri}\left(\dfrac{k}{10}\right)\delta\left(t - k\dfrac{T}{10}\right)$

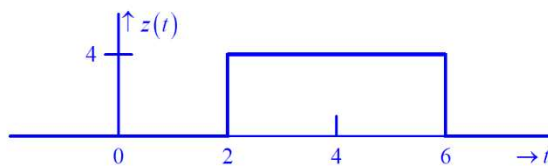Q1(b). $X_s(f) = 10T \sum_k \operatorname{sinc}^2\left[T\left(f - k\dfrac{10}{T}\right)\right]$

Q1(c).   Without any anti-aliasing filter, there will definitely be aliasing.

Q2(a). $X(f) = j8\sin(2\pi f)$

Q2(b). $Y(f) = 8\operatorname{sinc}(2f)$

Q2(c). $z(t) = 4\operatorname{rect}\left(\dfrac{t - 4}{4}\right)$

Q3(a). $E_x(f) = e^{-4|f|}$
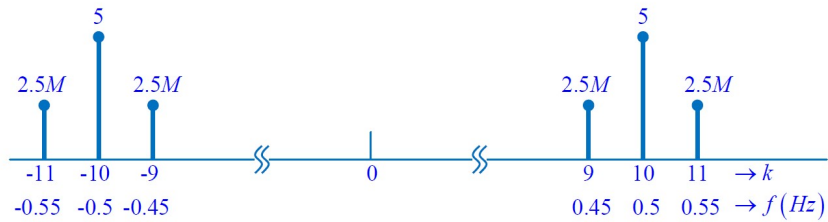
Q3(b). $B_{3dB} = 0.25\ln(2) = 0.173$

Q3(c). $E_{3dB} = 0.25$

Q4(a). Fundamental frequency, $f_0 = 0.05$ Hz.

Q4(b). Frequency components which are non-zero are associated with c_k which are non-zero.

$$c_k = \begin{cases} 2.5M; & k = \pm 9 \\ 5; & k = \pm 10 \\ 2.5M; & k = \pm 11 \end{cases} \rightarrow \begin{array}{l} \text{frequency components}: \quad \pm 9 \times 0.05 = \pm 0.45 \text{ Hz} \\ \text{frequency components}: \quad \pm 10 \times 0.05 = \pm 0.5 \text{ Hz} \\ \text{frequency components}: \quad \pm 11 \times 0.05 = \pm 0.55 \text{ Hz} \end{array}$$

Q4(c).

Q4(d). $M = 0.5$