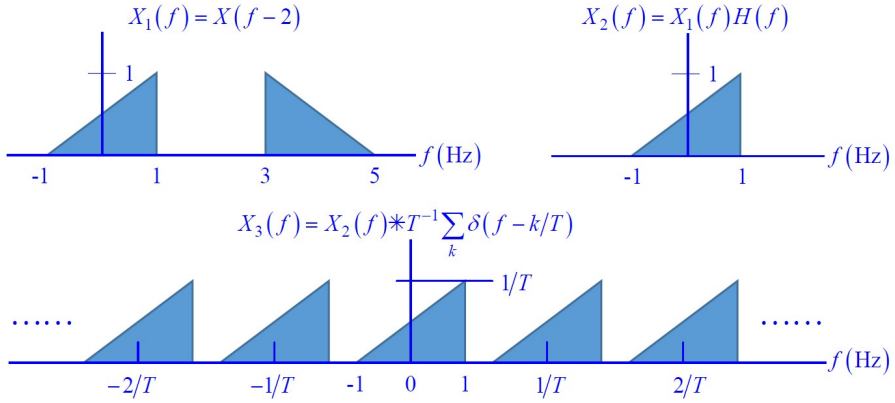
**EE2023 Signals and Systems Mid-term Quiz – AY2014/2015 Semester 1**

Q1(a).




Q1(b). $x(t)$ is not recoverable from $x_3(t)$ irrespective of the value of $T$.

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Q2(a). $$X(f)=\frac{1}{3}\delta\left(f+\frac{1}{3}\right)+\frac{1}{3}\delta(f)+\frac{1}{3}\delta\left(f-\frac{1}{3}\right)$$

Q2(b). $$x(t)=\frac{1}{3}+\frac{2}{3}\cos\left(2\pi\frac{1}{3}t\right)$$

Q2(c). $$X_k=\begin{cases}1/3; & k=-1,0,1\\ 0; & \text{otherwise}\end{cases}$$

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Q3(a). $T_p=2\pi$

Q3(b). $c_n=\int_{-\pi}^{\pi}x(t)e^{-j\pi t}dt$

Q3(c)i. $c_0=0$

Q3(c)ii. $$\frac{\pi}{4}=\sum_{n=1}^{\infty}\frac{(-1)^{n+1}\sin(n\pi/2)}{n}=1-\frac{1}{3}+\frac{1}{5}-\frac{1}{7}+\cdots$$

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Q4(a). $$X(f) = \frac{\cos^2(\pi f)}{\pi\left(0.25 - f^2\right)}$$

Alternate answer: $X(f) = \left[\text{sinc}(f + 0.5) + \text{sinc}(f - 0.5)\right]\cos(\pi f)$

Q4(b). $$x_p(t) = x(t) \otimes \sum_k \delta(t - 3k) = \sum_k x(t - 3k)$$

Q4(c). $$X_k = 3\frac{\cos^2(\pi k / 3)}{\pi\left(2.25 - k^2\right)}$$