# IC260- Signals and Systems
# Tutorial-3

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| Date | : | 29/04/2013 |
| Time | : | 02.00 pm to 02.50 pm |
| Max. marks | : | 20 |
| **Good Luck!!** | | |

Q.1 Consider the periodic signals $x_1(t), x_2(t)$ & $x_3(t)$ (shown in Figure 1) and determine the followings:

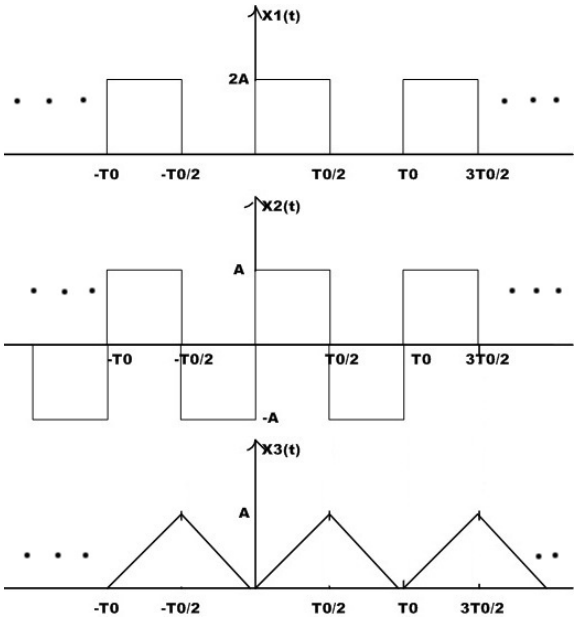


Figure 1:

(a) The Fourier series coefficients of the signal $x_1(t)$.

(b) The relation between the Fourier series coefficients of $x_1(t)$ & $x_2(t)$.

(c) The relation between the Fourier series coefficients of $x_1(t)$ & $x_3(t)$.

Marks : 6

Q.2 Determine and sketch the sequence $x[n]$ based on the following parameters:

(a) $x[n]$ is periodic with period $N = 6$.

(b) $\sum_{n=0}^{5} x[n] = 2$.

(c) $\sum_{n=2}^{7} (-1)^n x[n] = 1$.

(d) $x[n]$ has the minimum power per period among the set of signals satisfying the preceding three conditions.

[Hint: Use Fourier series representation of discrete time sequence]

Marks : 4

Q.3 Suppose signal $x(t) = \sum_{k=-3}^{3} a_k e^{jk2\pi t}$ is given as input to a LTI system whose impulse response is $h(t) = e^{-t}u(t)$. Then how many harmonics will be presented in the response? Also calculate the strength of the harmonics. Given: $a_0$ = area under a unit impulse, $a_{-1} = a_1 = \frac{a_0}{4}$, $a_{-2} = a_2 = \frac{1}{2a_0}$ and $a_{-3} = a_3 = \frac{1}{a_0+2}$.

Marks : 4

Q.4 One LTI system is defined by the following difference equation:

$$y[n] - ay[n-1] = x[n].$$

Plot the frequency response (magnitude and phase) of the system for any negative value of $a > -1$ and any posistive value of $a < 1$. Also calculate the step response of the system.

Marks : 6