IC260- Signals and Systems

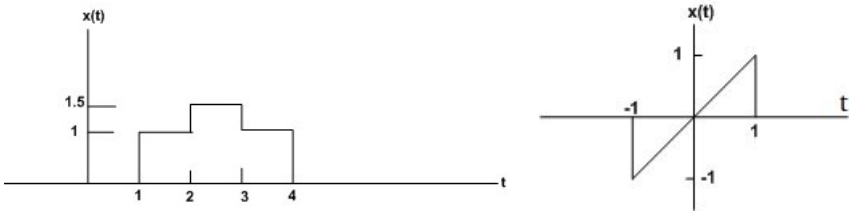
Tutorial-4

Date	:	09/05/2013
Time	:	10.30 am to 11.59 am
Max. marks	:	20
Good Luck!!		

Q.1 Find the Fourier transform of the followings:

(a) Signals shown in Figures 1(a) and 1(b).

(b) $x(t) = \frac{1}{a^2 + t^2}$.



(a) (b)

Figure 1: Required figure for Q.1.

Marks : 6

Q.2 Find the impulse response of an ideal low-pass filter.

Marks : 2

Q.3 The Fourier transform of a two-dimensional signal $x(t_1, t_2)$ is defined as:

$$X(\omega_1, \omega_2) = \int_{-\infty}^{\infty} \int_{-\infty}^{\infty} x(t_1, t_2) \exp(-j(\omega_1 t_1 + \omega_2 t_2))\, dt_1 dt_2.$$

Determine the Fourier transform of the following signals

(a) $x(t_1, t_2) = \exp(-t_1 + 2t_2)u(t_1 - 1)u(2 - t_2)$.

(b) $x(t_1, t_2) = \exp(-|t_1| - |t_2|)$, which is zero other than interval of $-1 < t_1 \leq 1$ and $-1 < t_2 \leq 1$.

Marks : 5

Q.4 Prove the Parseval's relation:

$$\int_{-\infty}^{+\infty} |x(t)|^2 \, dt = \frac{1}{2\pi} \int_{-\infty}^{+\infty} |x(j\omega)|^2 \, d\omega.$$

Marks : 3

Q.5 Consider a continuous time LTI system described by:

$$\frac{dy(t)}{dt} + 2y(t) = x(t)$$

. Using the Fourier transform, find the output $y(t)$ to each of the following input signals:

(a) $x(t) = e^{-t}u(t)$.

(b) $x(t) = u(t)$.

Marks : 4