JAYPEE UNIVERSITY OF INFORMATION TECHNOLOGY, WAKNAGHAT

MAKEUP EXAMINATION-2016

B.Tech. 3rd Sem.

COURSE CODE: 10B11EC301   MAX. MARKS:25

COURSE NAME: Signals and Systems

COURSE CREDITS: 04   MAX.TIME: 1Hr 30Min

Note: All the questions are compulsory. Carrying of mobile phone during examinations will be treated as case of unfair means.

Qu.-1: (a) Check, whether the following systems are causal and stable:

$$(i)\ \ y(t) = \int_{-\infty}^{2t} x(\tau)d\tau \qquad\qquad (ii)\ \ y(t) = \frac{dx(t)}{dt}$$

(b) Suppose that

$$x(t) = \begin{cases} 1, & 0 \le t \le 1 \\ 0, & otherwise \end{cases} \quad \text{and } h(t) = x(t/\alpha) \quad \text{where } 0 < \alpha = <1$$

Determine and sketch $y(t) = x(t) * h(t)$ [3+3=6]

Qu.-2: (a) Suppose $x(n)$ is a periodic signal with period N. Show that the Fourier series coefficients of the periodic signal

$$g(t) = \sum_{k=-\infty}^{\infty} x[k]\delta(t - kT)$$

are periodic with period N.

(b) Suppose that x(t) is a periodic signal with period T and Fourier series coefficients a_k with period N. Show that there must exist a periodic sequence g[n] such that

$$g(t) = \sum_{k=-\infty}^{\infty} x[k]\delta(t - kT/N)$$

[3+3=6]

Qu-3: Consider the Fourier transform pair

$$e^{-|t|} \leftrightarrow \frac{2}{1+\omega^2}$$

  (a) Find $te^{-|t|}$
  (b) Use the result of (a), along with duality property, to determine the Fourier transform of
  $$\frac{24t}{(1+t^2)^2}$$

[4+4=8]

Qu-4: The Fourier transform of a particular signal is

$$X(e^{j\omega}) = \sum_{k=0}^{3} \frac{(\frac{1}{2})^k}{1-\frac{1}{4}e^{-j(\omega-\frac{\pi}{2k})}}$$

It can be shown that
$$x(n) = g[n]q[n]$$
where g[n] is of the form $\alpha^n u[n]$ and q[n] is a periodic signal with period N
  (a) Determine the value of α
  (b) Determine the value of N.
  (c) Is x[n] real?

[2+2+1=5]