M 23188

Reg. No. : .....

Name : .....

IV Semester B.Tech. Degree (Reg./Sup./Imp.– Including Part Time) Examination, May 2013
(2007 Admn. Onwards)
PT2K6/2K6EC/AEI 404 : SIGNALS AND SYSTEMS

Time : 3 Hours Max. Marks : 100

***Instruction** : Answer **all** questions.*

PART – A

Answer **all** questions.

I. a) What is the difference between a deterministic signal and a random signal ? Explain with an example.

b) Check whether the following system is linear or not ? Prove it ?

$$y(n) = \frac{x(n-5) + x(n-7)}{x(n-2)\, x(n-3)}$$

c) State and prove the frequency shifting property of CTFT.

d) Explain the ideal reconstruction of original signal from the samples.

e) Find the DTFT of $x(n) = \left(\frac{1}{3}\right)^n u(n)$.

f) Explain an inverse system.

g) State and prove the initial value theorem of Z-transform.

h) Prove any 2 properties of the Z-transform. **(8×5=40)**

P.T.O.

PART – B

II. a) Perform convolution of x (n) and h (n) where $x(n) = \{1, \underset{\downarrow}{2}, 3, 4\}$ and $h(n) = \{\underset{\downarrow}{2}, 3, 1, 1\}$. **6**

b) Find the output response of the system described by the differential eqn.

$$\frac{d^2y(t)}{dt^2} + 7\frac{dy(t)}{dt} + 12y(t) = \frac{dx(t)}{dt} + x(t)$$

where x(t) = u(t), and the initial conditions are $y(0^+) = 1$; $\frac{dy(0^+)}{dt} = 1$. **9**

OR

c) The impulse response $h(t) = \begin{cases} 4(t) & 0 \le t \le T \\ 0 & \text{otherwise} \end{cases}$. The input signal $x(t) = e^{-at}u(t)$. Find the o/p of the system y(t) for

i) $t < 0$,

ii) $0 < t < T$,

iii) $t > T$. **10**

d) Discuss any three classification of signals with an example. **5**

III. a) Find the Fourier transform of

$$x(t) = \begin{cases} 1 & 0 \le t \le 1 \\ -1 & -1 \le t \le 0 \\ 0 & \text{otherwise} \end{cases}$$ **7**

b) State and prove the convolution and multiplication property of CTFT. **8**

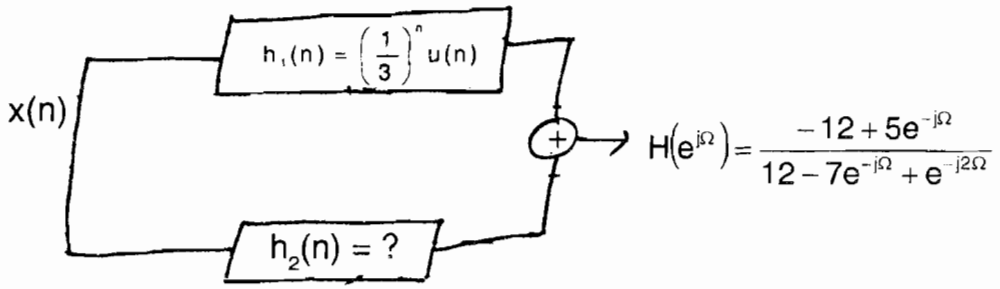
OR

c) Using the property find out the Fourier transform of the signal

$$x(t) = \frac{d}{dt}\left\{\left[e^{-2t}u(t)\right] * \left[e^{-3t}u(t-3)\right]\right\}.$$ **9**

d) Prove the Parseval's theorem for CTFS. **6**

IV. a) Determine $h_2(n)$ for the given system. **15**



OR

b) Find the DTFT of signal

$$x(n) = \left(\frac{1}{2}\right)^n \quad n \geq 0$$
$$\left(\frac{1}{3}\right)^n \quad n < 0 \quad \textbf{7}$$

c) Determine the step response of a continuous time LTI system described by the differential equation using Laplace transform

$$\frac{d^2y(t)}{dt^2} + 5\frac{dy(t)}{dt} + 6y(t) = x(t). \quad \textbf{8}$$

V. a) Using the property find out the Z-transform of the signal for $|a| < 1$ and also the ROC $x(n) = n\,a^n\,u(n)$. **10**

b) What is ROC of Z-transform ? Explain. **5**

OR

c) Determine the poles and zeros for the given differential equation. Also find out ROC

$$y(n) - \frac{5}{6}y(n-1) + \frac{1}{6}y(n-2) = x(n) - x(n-1). \quad \textbf{8}$$

d) Find out the Z-transform of the signal

$$x(n) = \left(\frac{1}{5}\right)^n u(n) + \left(\frac{1}{8}\right)^n u(n). \quad \textbf{7}$$