(23)

SE - ET
Sem IV (CBSGS)
S.S

15/12/2014

QP Code :12561

(3 Hours) **[Total Marks : 80**

N.B. (1) Question No. 1 is **compulsory.**
(2) Attempt any **three** questions **out of** the remaining **five** questions.
(3) Assume suitable **data** wherever **necessary.**

1. (a) Determine the fundamental period of the following signals :— **20**

(i) $x(t) = \cos\frac{\pi}{3}t + \sin\frac{\pi}{4}t$

(ii) $x[n] = \cos^2\frac{\pi}{8}n$

(b) State and prove Time Shifting and Time Scaling property of continuous time Fourier Transform.

(c) For the following system, determine whether it is. (i) memory less, (ii) causal, (iii) linear, (iv) time-invariant $y[n] = x[n^2]$

(d) Find out even and odd component of the following two signals :

(i) $x(t) = t^3 + 3t$

(ii) $x[n] = \cos n + \sin n + \cos(n) \sin(n)$

(e) Determine whether the signals are power or energy signals. Calculate energy / power accordingly :

(i) $x(t) = 0{\cdot}9\, e^{-3t} u(t)$

(ii) $x[n] = u[n]$

2. (a) Find the inverse Laplace Transform of $\frac{s-2}{s(s+1)^3}$ **5**

(b) Let $x(t) = 1 \ldots\ldots 0 \le t \le 2T$ and ; $h(t) = e^{-at} \ldots . 0 \le t \le T$. Compute y(t) using graphical convolution approach. **10**

(c) State and discuss the properties of the region of convergence for Z Transform. **5**

3. (a) An LTI system is characterized by the system function : **10**

$$H(z) = \frac{z}{\left(z-\frac{1}{4}\right)\left(z+\frac{1}{4}\right)\left(z-\frac{1}{2}\right)}$$

Write down possible ROCs. For different possible ROCs, determine causality and stability and impulse response of the system.

(b) Calculate Z transform of the following signals : **10**

(i) $x[n] = n\left(-\frac{1}{4}\right)^n u[n] * \left(-\frac{1}{6}\right)^{-n} u[-n]$

(ii) $x[n] = u[n-6] - u[n-10]$