328415(28)

B. E. (Fourth Semester) Examination, Nov.-Dec., 2007

(AEI, EI, Et and T Engg. Branch)

SIGNALS and SYSTEMS

Time Allowed : Three hours

Maximum Marks : 80

Minimum Pass Marks : 28

Note : *Part (a) of each unit is compulsory. Attempt any two parts from (b), (c) & (d). Answer should be brief and to the point. Unnecessary long answer may result in loss of marks.*

Unit-I

1. (a) Define linear time invariant system. 2

(b) Check whether the following system is : 7

(i) Static or dynamic

(ii) Linear or non-linear

(iii) Causal or non-causal

(iv) Time invariant or time variant

Given that :

$$y[n] = \sum_{k=-\infty}^{n+1} x(K)$$

(c) Sketch the following signals and calculate their energies : 7

(i) $e^{-10t}u(t)$

(ii) $u(t) - u(t-15)$

(d) Give the graphical and mathematical representation of following sequences : 7

(i) Unit step sequence

(ii) Unit ramp sequence

(iii) Unit sample sequence

(iv) Exponential sequence

Unit-II

2. (a) Define Fourier transform of a signal $x(t)$. What is the condition for existence of Fourier transform of signal $x(t)$. 2

(b) State and prove following properties of Fourier transform :

(i) Linearity

(ii) Time shifting

(iii) Time scaling

(c) For the transfer function :

$$H(s) = \frac{s+10}{s^2+3s+2}$$

Find the response $y(t)$ due to input $x(t) = \sin 2t \cdot u(t)$

(d) For the continuous time periodic signal

$$x(t) = 2 + \cos\left(\frac{2\pi}{3}t\right) + 4\sin\left(\frac{5\pi}{3}t\right)$$

determine the fundamental frequency Ω_o and fourier series coefficient C_n such that $x(t) = \sum_{n=-\infty}^{\infty} C_n e^{jn\Omega_o t}$.

Unit-III

3. (a) Define State of a system.

(b) Find the state space representation of the following system whose differential equation representation is