Roll No. Total No. of Pages : 3

BT-4/J08 8651

Signals and Systems

Paper : EE-208 E

Time : Three Hours] [Maximum Marks : 100

Note :— (1) All questions carry equal marks.

(2) Attempt **FIVE** questions, selecting at least **ONE** question from each unit.

UNIT—I

1. (a) Compute the convolution y(n) of the signals :

$$x(n)=\begin{cases}\alpha^n, & -3\le n\le 5\\ 0, & \text{elsewhere}\end{cases}$$

$$h(n)=\begin{cases}1, & 0\le n\le 4\\ 0, & \text{elsewhere.}\end{cases}$$

10

(b) What is Fourier series as a complex exponential ? 10

2. (a) Given the following signal :

(i) $2\cos 3\pi t + 3\sin 6\pi t$

(ii) $e^{-5t}\,u(t)$.

Identify the periodic signals and aperiodic signals and their fundamental period. 10

(b) Find Fourier transform of a signum function. 10

UNIT—II

3. (a) Determine the z-transform of the signal :

$$x(n) = -\alpha^n\, u(-n-1) = \begin{cases} 0 & n \geq 0 \\ -\alpha^n & n \leq -1. \end{cases}$$ 10

(b) Sketch the single sided and double sided spectrum of

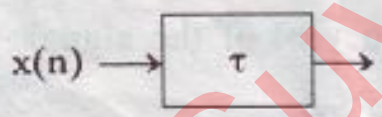
$x(t) = 6 \cos [6 \pi t - \pi/3]$. 10

4. (a) Explain sampling theorem and its proof. 10

(b) Explain the characterization of stochastic signals. 10

UNIT—III

5. (a) Determine if the system shown in fig.



is time invariant or time variant. 10

(b) Determine if system described by following input-output equations is linear or non-linear

$y(n) = Ax(n) + B$. 10

6. (a) Explain analog and discrete system. 10

(b) Explain Deterministic and Stochastic system. 10

UNIT—IV

7. (a) What is meant by state transition matrix ? State the properties of state transition matrix. 10

(b) Explain Linear time invariant system properties. 10

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8. (a) Obtain the response of the states of following systems

$$\begin{bmatrix} \dot{x}_1 \\ \dot{x}_2 \end{bmatrix} = \begin{bmatrix} -1 & 0 \\ 0 & -2 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \end{bmatrix} + \begin{bmatrix} 1 \\ 1 \end{bmatrix} r(t)$$

where r(t) is unit step occurring at $t = 0$ and $x_0^T = [1 \quad 0]$. (10)

(b) Find the state transition matrix for

$$A = \begin{bmatrix} 0 & 1 \\ -6 & -5 \end{bmatrix}.$$ (10)