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Total No. of Pages : 3

BT-4/M09

9331

Signal and System

Paper : EE-208-E

Time : Three Hours]

[Maximum Marks : 100

Note :– Attempt any **FIVE** questions.

UNIT–I

1. (a) Explain periodic and aperiodic signals with examples.

   (b) Determine whether the following signal is periodic or not ?

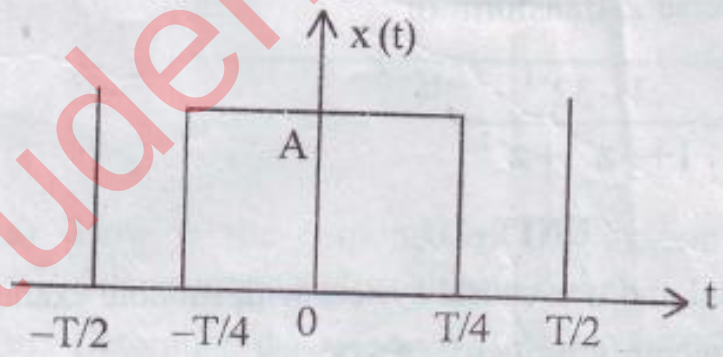
   $x(t) = \sin \sqrt{2}\,\Pi t$.

   (c) Determine the even and odd components of each of the following signal :

   $x(t) = 1 + t + 2t^2 + 5t^3 + 8t^4$.

   (d) Given a complex-valued exponential signal $x(t) = Ae^{\alpha t + jwt}$ for $\alpha > 0$.

2. (a) Enumerate what are the Drichlet's conditions. Following fig. shows the peridic rectangular waveform. Obtain its Fourier Series representation.



   (b) A damped sine wave is expressed as :

   $x(t) = e^{-at} \sin wt$

   Obtain Laplace transform of the signal.

UNIT–II

3. (a) Explain and define cumulative distribution function (CDF) and explain its various properties. Also determine whether the following function is CDF :

$$F_x(x) = \begin{cases} 0 \text{ for } x < a \\ 1/2\,(x/a+1) \text{ for } -a \le x \le a \\ 1 \text{ for } x > a \end{cases}$$

(b) A joint probability density function of two random variables X and Y is given as :

$$f_{xy}(x, y) = \begin{cases} e^{-(x+y)} & \text{for } x \ge 0, y \ge 0 \\ 0 & \text{otherwise} \end{cases}$$

determine the following :

(i) $P(X < 1)$

(ii) $P(X > Y)$

(iii) $P(X+Y < 1)$.

4. (a) State and explain sampling theorem for continuous-time signals. Also discuss zero order and first order field. Also explain what is meant by Aliasing.

(b) Find the inverse Z-transform of :

$$X(z) = \frac{1-32^{-1}}{1+\frac{3}{5}z^{-1}+z^{-2}}$$

UNIT–III

5. (a) Explain causal and non causal system with suitable examples.

(b) Explain the memory property of systems.

(c) Test the following system for linearity, time-in variance and casuality.

(i) $a(n) = b(-n + 5)$

(ii) $a(n) = b(n)\ \text{Sin}\ (w_o n)$

6. (a) Given a continuous-time (LTI) system with unit impulse response h (t). A continuous-time signal x(t) is applied to the input of this LTI system where :

$$x[t] = e^{-at} . u[t] \text{ for } a > 0$$

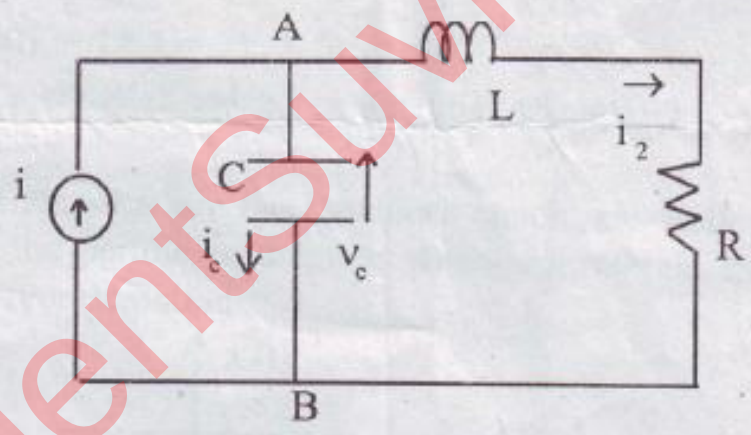
and h (t) = u (t). Evaluate the output y (t).

(b) Write a Technical note on SIMO and MIMO system.

UNIT–IV

7. (a) Explain what is meant by State, State Variables and State Vectors. Discuss the State-Variable representation of an LTI system. Also explain the advantage of State Space method over traditional representation method.

(b) Consider the network shown in fig. below. Obtain the state equation of the system.



8. (a) How is the response of LTI system determined for the deterministic and stochastic signal ?

(b) Determine the response $y(n) \geq 0$ of the system described by the following difference equation. Also draw its state diagram.

$$y(n) - 2y(n-2) + 4y(n-2) = x(n) + 2 - 4x(n-1)$$

to the input $x[n] = 2^n u(n)$.