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BT-4/M11 8411

Signals and Systems

Paper : EE-208E, Option : II

Time : Three Hours] [Maximum marks : 100

Note :— Attempt **FIVE** questions, selecting at least **ONE** question from each unit.

UNIT—I

1. (a) Determine whether the following signals are periodic or not :

   (i) $x(t) = \sin \sqrt{2}\, \pi t$

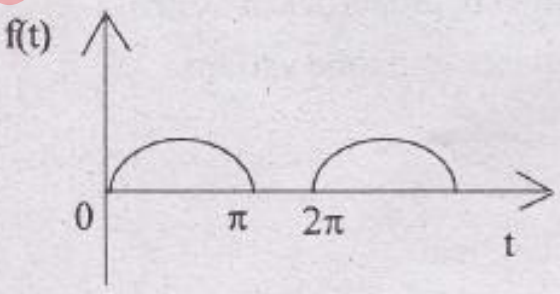
   (ii) $x(t) = 15\, \pi t$

   (b) Explain the concept of signal representation in terms of singular functions, orthogonal functions and their use in signal representation.

2. (a) Given on complex-valued exponential signal :

   $x(t) = A\, e^{(\alpha t + j\omega t)}$ for $\alpha > 0$. Evaluate the real and imaginary components of x(t).

   (b) Figure shows the graph for a halfwave rectified sine wave. Obtain the trigonometric Fourier Series representation.



UNIT—II

3. (a) Explain the concepts of moment, distribution and correlation function.

(b) Find the inverse z-transform of the :

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

4. (a) Sketch the single sided and double sided spectrum of :

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

(b) Explain the properties of Laplace transform and z-transform and their relationship with each other. Also define the ROC.

UNIT—III

5. Explain the difference between :

(i) Lumped and distributed system

(ii) Causal and non-causal system

(iii) Analog and discrete system

(iv) Memory and memoryless system—explain with examples.

6. (a) Explain the following properties of LTI systems :

(i) The cumulative property

(ii) The distributive property.

(b) Explain the following properties of system :

(i) Time invariance and time variance

(ii) Stability

(iii) Linearity

(iv) Memory of system

(v) Order of the system.

UNIT—IV

7. (a) Determine the unit step response of the system described by the difference equation :

$$y(n) = 0.9\, y(n-1) - 0.81\, y(n-2) + x(n)$$

under the following condition :

$$y(-1) = y(-2) = 0.$$

(b) For the system specified by the equation :

$$y(k+1) - 0.8y(k) = f(k+1).$$

Find the response to the input $f(k) = 1$.

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

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

Evaluate the output y(t).

(b) Explain the concept of finding the response to deterministic and stochastic signal.