

Roll No.

Total No. of Pages : 3

BT-4/M11

8411

Signals and Systems

Paper : EE-208E, Option : II

Time : Three Hours]

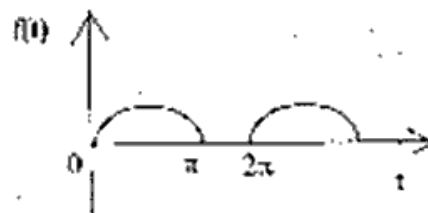
[Maximum marks : 100

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 a complex-valued exponential signal :

$$x(t) = A e^{(a + j\omega)t}$$
 for $a > 0$. 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.