EC 214 (R-22)

Total No. of Questions : 10] [Total No.of Pages : 02

II/IV B. Tech. DEGREE EXAMINATIONS, AUGUST - 2024

First Semester

ELECTRONICS AND COMMUNICATIONS ENGINEERING

SIGNALS AND SYSTEMS

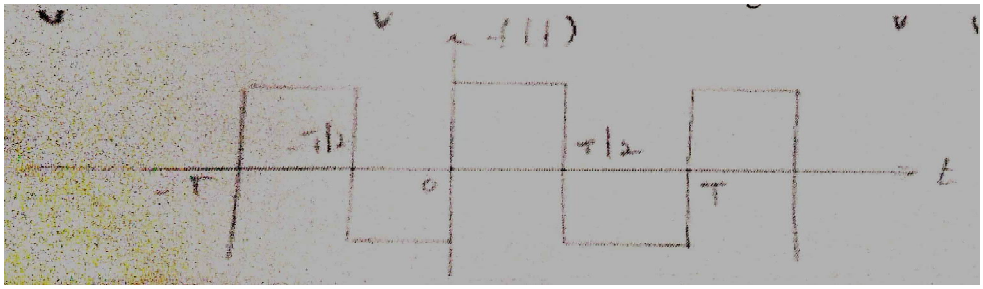
Time : **Three Hours** Maximum : **70** Marks

Answer ONE Question from each Unit. 5x14=70 M

All Questions carry equal marks.

UNIT - I

1. a) Find Trigonometric Fourier Series for the following waveform ?



b) Prove that Cos $n\omega_o t$ and Cos $m\omega_o t$ are orthogonal to each other for all integers m, n.

(OR)

2. a) Find the power and rms value of the signal x(t) = 10cos10Πt.

b) State and prove the convolutional and linear properties of Fourier series.

UNIT - II

3. a) Find the Fourier Transform of Signum Function.

b) Find out the response of LTI system with $x(t) = e^{(-2t)}\, u(t)$, h(t) = u(t-1).

(OR)

4. a) Explain filter characteristics of linear systems. What are the conditions to obtain distortion less transmission through the linear systems ?

b) State and prove any two properties from Fourier Transform.

P.T.O.

UNIT - III

5. a) What are the disadvantages of under-sampling ? For a signal x(t), calculate Nyquist rate and Nyquist interval, $x(t) = 3 \cos 25\pi t = 10 \sin 200\pi t + \cos 300\pi t$.

   b) Compute the auto-correlation function and energy spectral density of $x(t) = e^{at}\, u(t)$.

(OR)

6. a) State and prove the sampling theorem.

   b) Derive the expression for Energy and power density functions.

UNIT - IV

7. a) Find the Laplace transform of the following signals.

   (i) Impulse function (ii) Unit step function.

   b) Find the Laplace transform of the signal $x(t) = e^{-at}\, u(t) + e^{-bt}\, u(-t)$.

(OR)

8. a) Find the signal x(t) that corresponds to the Laplace transform

$$X(S) = \frac{3S^2 + 22S + 27}{(S^2 + 3S + 2)(S^2 + 2S + 5)}$$

   b) State and prove initial and final value theorems.

UNIT - V

9. a) Find the Z transform of $x[n] = a^{n+1}\, u[n+1]$.

   b) Distinguish between one-sided and two sided z-transforms and its region of convergence.

(OR)

10. a) Using long division, determine the inverse Z- transform of $X(Z) = \dfrac{1}{1 - \frac{3}{2}Z^{-1} + \frac{1}{2}Z^{-2}}$.

   b) Determine the Z-transform and sketch the pole-zero plot with the ROC for each of the following signal: $x[n] = (0.5)^n\, u(n) - \left(\frac{1}{3}\right)^n u(n)$.