

SIDDHARTH INSTITUTE OF ENGINEERING & TECHNOLOGY:: PUTTUR
(AUTONOMOUS)

B.Tech II Year I Semester Regular & Supplementary Examinations December-2023

SIGNALS, SYSTEMS AND RANDOM PROCESSES

(Electronics and Communication Engineering)

Time: 3 Hours

Max. Marks: 60

(Answer all Five Units 5 x 12 = 60 Marks)

UNIT-I

- 1 a Define signal. Explain various elementary signals and indicate them graphically. **CO1 L2 6M**
 b Classify the signals with respect to continuous time and discrete time. **CO1 L2 6M**
- OR**
- 2 a Interpret whether the following systems are Linear or Non- Linear, Time Invariant or Time Variant and Stable or Unstable. **CO3 L3 12M**
 (i) $y(n) = \log_{10} |x(n)|$ (ii) $y(t) = at^2 x(t) + bt x(t-4)$

UNIT-II

- 3 a Explain about Fourier Transform of Periodic Signals. **CO2 L2 6M**
 b Find the Fourier Transform of the following signals using Properties. **CO2 L3 6M**
 (i) $e^{-at} u(t)$
 (ii) $\delta(t+2) + \delta(t+1) + \delta(t-1) + \delta(t-2)$
- OR**
- 4 a Demonstrate how Fourier Transform derived from Fourier series. **CO2 L2 4M**
 b State and Prove the Linearity, Time Shifting, Time Reversal and Time Convolution Properties of Fourier series. **CO2 L3 8M**

UNIT-III

- 5 a State and Prove the Following Properties of LTI System. (i) Distributive Property (ii) Associative Property **CO2 L3 6M**
 b The impulse response of a continuous-time system is expressed as $h(t) = e^{-2t} u(t)$. Find the Frequency response of the system. **CO2 L3 6M**

OR

- 6 a Explain the Filter characteristics of linear systems with neat diagrams. **CO2 L2 6M**
 b Demonstrate the Procedure to perform convolution graphically. **CO4 L2 6M**

UNIT-IV

- 7 a State and prove the Linearity and Time Shifting Properties of Laplace Transform. **CO2 L3 6M**
 b Define Random variable and explain briefly. **CO6 L2 6M**
- OR**
- 8 a Examine the distribution function $F_{xx}(x,y)$ **CO6 L3 6M**

(X,Y)	(0,0)	(1,2)	(2,3)	(3,2)
P(x,y)	0.2	0.3	0.4	0.1

- b A random variable X has a probability density function **CO6 L3 6M**
 $f_x(x) = C(1-x^4) \quad -1 < x < 1$
 $= 0 \quad \text{Otherwise}$
 Determine the constant 'C'.

UNIT-V

- 9 a Explain the concept of Random process. C06 L2 6M
b Describe the concept of power spectral density. List the properties of power spectral density. C06 L2 6M

OR

- 10 a The power spectral density of a stationary random process is given by C06 L3 6M
$$S_{xx}(\omega) = A ; \quad -k < \omega < k$$
$$= 0 ; \quad \text{otherwise}$$
Find the auto correlation function.
b Show that the autocorrelation function of a stationary random process is an even function of τ . C06 L2 6M

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