Reg. No:

## SIDDHARTH INSTITUTE OF ENGINEERING & TECHNOLOGY:: PUTTUR
### (AUTONOMOUS)
### B.Tech II Year I Semester Regular Examinations May-2022
### SIGNALS, SYSTEMS AND RANDOM PROCESSES
(Electronics and Communication Engineering)

Time: 3 hours                                                                 Max. Marks: 60M

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

### UNIT-I

| | | | | |
|---|---|---|---|---|
| 1 | a | Define signal. Explain various elementary signals and indicate them graphically. | L2 | 6M |
| | b | Sketch the following signals. | L3 | 6M |
| | | (i)     x(t)=2 u(t+2)- 2 u(t-3)     (ii) x(t)=r(t)-r(t-1)-r(t-3)+r(t-4) | | |

**OR**

| | | | | |
|---|---|---|---|---|
| 2 | a | Define Stable and Unstable systems with an example. | L2 | 6M |
| | b | Determine whether the following systems are stable or not | L3 | 6M |
| | | (i)     y(t)= (t+5) u(t) | | |
| | | (ii)    h(n)=an for 0<n<11 | | |

### UNIT-II

| | | | | |
|---|---|---|---|---|
| 3 | a | Explain about representation of Fourier series and discuss the Dirichlet's Conditions. | L2 | 6M |
| | b | State and Prove the Linearity, Time Shifting, Time Reversal and Time Convolution Properties of Fourier series. | L3 | 6M |

**OR**

| | | | | |
|---|---|---|---|---|
| 4 | a | State and prove any four properties of Continuous time Fourier transform. | L3 | 6M |
| | b | Find the Fourier transform, magnitude and phase response of the given signal. $x(t) = e^{-t} \cos 5t \, u(t)$ | L3 | 6M |

### UNIT-III

| | | | | |
|---|---|---|---|---|
| 5 | a | Derive the Transfer function of LTI system. | L3 | 6M |
| | b | Explain the Filter characteristics of linear systems with neat diagrams. | L2 | 6M |

**OR**

| | | | | |
|---|---|---|---|---|
| 6 | a | Define Auto correlation of signals. Explain any two properties of Auto correlation function. | L2 | 6M |
| | b | Define Cross correlation of signals. Explain any two properties of Cross correlation function. | L2 | 6M |

### UNIT-IV

| | | | | |
|---|---|---|---|---|
| 7 | a | Define Laplace Transformation. Determine the Laplace transform of the signal $x(t)= e^{-at} u(t) - e^{-bt} u(-t)$ and also find its ROC. | L3 | 6M |
| | b | Find the Laplace transforms and ROC for the following signals. | L3 | 6M |
| | | i.     x(t)=e-5t u(t-1) | | |
| | | ii.    x(t)=e-a $|t|$ | | |

**OR**

| | | | | |
|---|---|---|---|---|
| 8 | a | Define Probability. | L1 | 6M |
| | b | Define the following with examples. | L1 | 6M |
| | | i. Sample space | | |
| | | ii. Event | | |
| | | iii. Mutually exclusive events. | | |
| | | iv. Independent events | | |

**R20**

## UNIT-V

9  a  Differentiate the Distribution and Density functions of a Random Process.   **L2**   **6M**
   b  Prove that the Power Spectral Density of the derivative X(t) is equal to ω2 times   **L5**   **6M**
      the Power Spectral Density of Sxx(ω).

### OR

10  Prove the followings.   **L3**   **12M**
   (i)     $|R_{xx}(\tau)| \leq R_{xx}(0)$
   (ii)    $R_{xx}(-\tau) = R_{xx}(\tau)$
   (iii)   $R_{xx}(0) = E[X^2(t)]$

*** END ***