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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) $x(t)=2u(t+2)-2u(t-3)$ (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 L2 6M
 Conditions.
 b State and Prove the Linearity, Time Shifting, Time Reversal and Time L3 6M
 Convolution Properties of Fourier series.

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. L3 6M
 $x(t) = e^{-t} \cos 5t u(t)$

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 L2 6M
 function.
 b Define Cross correlation of signals. Explain any two properties of Cross L2 6M
 correlation function.

UNIT-IV

- 7 a Define Laplace Transformation. Determine the Laplace transform of the signal L3 6M
 $x(t) = e^{-at} u(t) - e^{-bt} u(-t)$ and also find its ROC.
 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

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 ω^2 times the Power Spectral Density of $S_{xx}(\omega)$. **L5 6M**

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 ***

UNIT-I

- 1 a Define signal. Explain voltage signal and indicate their applications. **L1 6M**
b Sketch the following signals. **L2 6M**
(i) $x(t) = 2\cos(2\pi t - \pi/4)$ (ii) $x(t) = 2\cos(2\pi t - \pi/4)$
2 a Define signal and explain its classification with an example. **L1 6M**
b Distinguish between the following systems for each or two. **L2 6M**
(i) $y(t) = x(t)$ (ii) $y(t) = x(t-1)$

UNIT-II

- 1 a Explain about representation of Fourier series and derive the Dirichlet's conditions. **L1 6M**
b State and prove the Parseval's time folding, time reversal and time scaling. **L2 6M**
c Calculate the Fourier series of a cosine wave.

UNIT-III

- 1 a Derive the Fourier function of LTI system. **L1 6M**
b Explain the time characteristics of linear systems with neat diagrams. **L2 6M**

UNIT-IV

- 1 a Explain Fourier Transform. Derive the Laplace transform of the signal. **L1 6M**
b Find the Laplace transform and ROC for the following signal. **L2 6M**
 $x(t) = e^{-t} \cos(2t) u(t)$

OR

- 1 a Define Probability. **L1 6M**
b Define the following with example. **L1 6M**
i Sample space
ii Event
iii Mutually exclusive events
iv Independent events