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

B.Tech II Year I Semester Regular & Supplementary Examinations March-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**

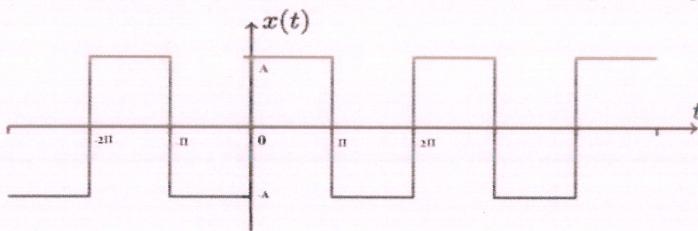
- 1 a Find whether the following signals are periodic or not? If periodic determine the fundamental Period. (i)  $\sin(12\pi t)$  (ii)  $\sin(10t+1)+2\cos(5t-2)$  (iii)  $e^{j4\pi t}$  CO1 L3 6M  
 b Define and Explain the Following with an example. CO2 L2 6M  
 (i) Energy and Power Signals (ii) Even and Odd Signals

OR

- 2 a Define the following Systems with an example CO1 L2 6M  
 (i) Static and dynamic. (ii) Causal and Non-causal  
 b Interpret via testing whether the following system is Static or Dynamic, Linear or Non-Linear, Time Invariant or Time Variant, Causal or No causal and Stable or Unstable. CO2 L4 6M  
 $y(t)=at^2 x(t)+bt x(t-4)$

**UNIT-II**

- 3 Develop the Exponential Fourier Series for the given signal below. CO3 L6 12M



OR

- 4 a Define Fourier transform and Evaluate the Fourier transform of  $x(t)=e^{-at}u(t)$  L1 6M  
 b List the properties of Continuous time Fourier transform and State & prove the Time shifting property of Continuous time Fourier transform CO3 L5 6M

**UNIT-III**

- 5 a Define linear time invariant and linear time variant system with necessary equations. CO4 L1 6M  
 b Define convolution and develop the convolution of the following signals CO4 L6 6M  
 $x_1(t) = e^{-3t}u(t)$  and  $x_2(t) = u(t)$

OR

- 6 a Define Auto correlation and list its properties CO4 L1 6M  
 b State and prove following properties of Auto correlation function. CO4 L5 6M  
 (i)  $R_{XX}(-\tau) = R_{XX}(\tau)$   
 (ii)  $R_{XX}(0) = E[X^2(t)]$

**UNIT-IV**

- 7 a Describe the Laplace domain analysis and list its properties CO5 L2 6M  
 b Find the Laplace transforms and ROC for the following signals. CO5 L3 6M  
 (i)  $x(t)=e^{-5t}u(t-1)$  (ii)  $x(t)=e^{-a|t|}$



OR

- 8 a Define the following with examples. (i) Probability (ii) Sample space (iii) Mutually exclusive events. CO6 L1 6M
- b Let X is a continuous random variable with density function CO6 L3 6M
- $$f_x(x) = \begin{cases} x/9+k & 0 < x < 6 \\ 0 & \text{Otherwise} \end{cases}$$
- (i) Find 'k'
- (ii) Find  $p[2 < x < 5]$

**UNIT-V**

- 9 a Define and Differentiate the Distribution and Density functions of a Random Process. CO6 L2 6M
- b Define and explain Stationary and Statistical Independence of Random process. CO6 L3 6M

OR

- 10 a Prove that the Power Spectral Density of the derivative X(t) is equal to  $\omega^2$  times the Power Spectral Density of  $S_{xx}(\omega)$ . CO6 L3 6M
- b Show that the autocorrelation function of a stationary random process is an even function of  $\tau$ . CO6 L2 6M

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