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

B.Tech II Year I Semester Supplementary Examinations December-2021

RANDOM SIGNAL & STOCHASTIC PROCESSES

(Electronics and Communication Engineering)

Time: 3 hours

Max. Marks: 60

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

UNIT-I

- 1 a Discuss about Total Probability Theorem. 6M
b Define axioms of probability. 6M

OR

- 2 a Explain about Joint and Conditional probability and also state the properties of Joint & Conditional probability. 6M
b Two cards are drawn from a 52 –card deck (the first is not replaced). 6M
i) Given that first card is a queen, what is the probability that the second is also a Queen. ii) Repeat part (i) but replace the first card with a queen & the second card with a 7.

UNIT-II

- 3 a State and prove the properties of correlation function. 6M
b Consider two random variables X and Y such that $Y = -4X + 20$. The mean value and the variance of X are 4 and 2 respectively. Find the correlation. 6M

OR

- 4 a Discuss about the Sum of Two Random Variables? 6M
b Statistically independent random variables X and Y have densities $f_X(x) = 5u(x)e^{-5x}$ 6M
 $f_Y(y) = 2u(y)e^{-2y}$ find the density of the sum $W = X + Y$

UNIT-III

- 5 a Show that autocorrelation function of a stationary random process is an even function of τ . 6M
b Give the classification of random processes. 6M

OR

- 6 a A random process is defined as $X(t) = A \sin(\omega t + \Theta)$, where A is a constant and Θ is a random Variable uniformly distributed over $(\pi, -\pi)$, check X(t) is stationary. 6M
b Prove the following 6M
i) $R_{XX}(\tau) \leq R_{XX}(0)$ ii) $R_{XX}(-\tau) = R_{XX}(\tau)$ iii) $R_{XX}(0) = E[X^2(t)]$

UNIT-IV

- 7 a Briefly explain the concept of cross power density spectrum. 6M
b Find the cross correlation of functions $\sin \omega t$ and $\cos \omega t$. 6M

OR

- 8 a Assume that the ergodic random process X(t) has an auto-correlation function $R_{XX}(\tau) = 18 + \frac{2}{(6 + \tau^2)} [1 + 4\cos(12\tau)]$. What is the average power of X(t). 6M
b Prove that $S_{XX}(\omega) = S_{XX}(-\omega)$. 6M

UNIT-V

- 9 a Explain about LTI system 6M
b Find the power density spectrum of response of a linear system. 6M

OR

- 10 a A WSS random process x(t) is applied to the input of an LTI system whose impulse The mean of x(t) is 3. Find the mean output of the system. 6M
b Give any two spectral characteristics of the system response. 6M

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