R15

Code No: 123BT

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
B.Tech II Year I Semester Examinations, March - 2017
PROBABILITY THEORY AND STOCHASTIC PROCESSES
(Common to ECE, ETM)

Time: 3 Hours **Max. Marks: 75**

Note: This question paper contains two parts A and B.
Part A is compulsory which carries 25 marks. Answer all questions in Part A.
Part B consists of 5 Units. Answer any one full question from each unit.
Each question carries 10 marks and may have a, b, c as sub questions.

PART – A

(25 Marks)

1.a) Define Random variable. [2]
b) Write about the continuous and mixed random variables. [3]
c) Mention the difference between the Variance and Skew. [2]
d) Write about the Rayleigh density and distribution function. [3]
e) Explain the equal and unequal distributions. [2]
f) Write about linear transformations of Gaussian random variables. [3]
g) Mention the properties covariance. [2]
h) Show that $S_{xx}(\omega) = S_{xx}(-\omega)$. [3]
i) State wiener-Khinchin relation. [2]
j) Express the relationship between power spectrum and autocorrelation. [3]

PART - B

(50 Marks)

2.a) Discuss the mutually exclusive events with an example.
b) Define probability, set and sample spaces. [5+5]

OR

3. Write the classical and axiomatic definitions of Probability and for a three digit decimal number chosen at random, find the probability that exactly K digits are greater than and equal to 5, for 0< K < 3. [10]

4.a) Obtain the relationship between probability and probability density function.
b) Find the moment generating function of the random variable whose moments are $m_r = (r + 1)!2^r$. [5+5]

OR

5.a) Write about Chebychev's inequality and mention about its characteristic function.
b) Determine the moment generating function about origin of the Poisson distribution. [5+5]

6.a) Differentiate between the marginal distribution functions, conditional distribution functions and densities.
b) Given the transformation y= cos x where x be a uniformly distributed random variable in the interval $(-\pi, \pi)$. Find f_y (y) and E[y]. [5+5]

OR

7. Let X be a random variable defined, Find E [3X] and E[X^2] given the density function as

$$f_x(x) = \begin{cases} (\pi/16)\cos(\pi x/8), & -4 \le x \le 4 \\ 0, & elsewhere \end{cases}$$ [10]

8.a) State and prove properties of cross correlation function.

b) If the PSD of X(t) is $S_{xx}(\omega)$. Find the PSD of dx(t)/dt. [5+5]

OR

9. A random process Y(t) = X(t)- X(t +τ) is defined in terms of a process X(t). That is at least wide sense stationary.

a) Show that mean value of Y(t) is 0 even if X(t) has a non Zero mean value.

b) If Y(t) = X(t) +X(t + τ) find E[Y(t)] and σY^2. [5+5]

10. The auto correlation function of a random process X(t) is $R_{XX}(\tau) = 3+2\exp(-4\tau^2)$.

a) Evaluate the power spectrum and average power of X(t).

b) Calculate the power in the frequency band $-1/\sqrt{2} \le \omega \le 1/\sqrt{2}$ [5+5]

OR

11. Derive the relation between PSDs of input and output random process of an LTI system. [10]

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