

Code No: 113BT**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD****B.Tech II Year I Semester Examinations, November - 2015****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) What is Total probability and Baye's Theorem? [2M]
b) Define Random Variable. [3M]
c) Explain probability density function with example. [2M]
d) Define expected value of a random variable. [3M]
e) Define joint distribution function with example. [2M]
f) Define joint central moment. [3M]
g) Write about the following with examples. [2M]
i) Discrete time stochastic process ii) Continuous time stochastic process.
h) Discuss Gaussian random process and state its properties. [3M]
i) Define power spectrum. [2M]
j) Discuss cross power density spectrum. [3M]

PART-B**[50 Marks]**

- 2.a) Define and explain the following with an example:
i) Equally likely events
ii) Exhaustive events
iii) Mutually exclusive events.
b) A class contains 9 boys and 3 girls.
i) In how many ways can the teacher choose a committee of 4?
ii) How many of them will contain at least one girl?
iii) How many of them will contain exactly one girl? [5+5]

OR

- 3.a) State the conditions for a function to be random variable
b) In experiment where the pointer on a wheel of chance is spun. The possible outcomes are the numbers from 0 to 12 marked on the wheel. The sample space consists of the numbers in the set $\{0 < S \leq 12\}$ and if the random variable X is defined as $X = X(S) = S^2$, map the elements of random variable on the real line and explain. [5+5]

- 4.a) Write short notes on the following
 i) Binomial ii) Poisson distribution.
 b) The random variable X has the discrete variable in the set $\{-1, -0.5, 0.7, 1.5, 3\}$ the corresponding probabilities are assumed to be $\{0.1, 0.2, 0.1, 0.4, 0.2\}$. Plot its distribution function and state is it a discrete or continuous distribution function. [5+5]

OR

- 5.a) Discuss Moment generating function and its properties.
 b) Calculate $E[X]$ when X is binomially distributed with parameters n and p. [5+5]
- 6.a) Discuss the properties of joint density function for two random variables X and Y.
 b) A joint probability density function is $f(x, y) = 1/ab$ for $0 < x < a, 0 < y < b$ and $f(x, y) = 0$ elsewhere. Find the joint probability distribution function. [5+5]

OR

- 7.a) Prove that the mean value of a weighted sum of random variables equals the weighted sum of mean values.
 b) Prove that if 'X' and 'Y' are random variables taking real values then $[E (XY)^2] \leq E [X^2] .E [Y^2]$. [5+5]

- 8.a) Discuss in detail about First order stationary random process
 b) The auto correlation function of a random process X(t) is $R_{XX} (\tau) = 3+2 \exp(-4\tau^2)$. Find the power spectrum of X(t). [5+5]

OR

- 9.a) Prove that autocorrelation function of a random process is even function of τ .
 b) Prove that $R_{XX} (\tau) = R_{XX} (0)$. [5+5]

- 10.a) Discuss the properties of cross power density spectrum?
 b) State and prove Wiener – Khintchine relationship. [5+5]

OR

- 11.a) Find the power density spectrum of a random process whose autocorrelation function is $R_{XX}(\tau) = A \cos(\omega_0\tau)$.
 b) A random process is defined as $Y (t) = X (t)-X (t-a)$, where X (t) is a WSS process and $a > 0$ is a constant. Find the PSD of Y (t) in terms of the corresponding quantities of X (t). [5+5]

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