Code No: RT22042 **R13** SET - 1

**II B. Tech II Semester Supplementary Examinations, Dec/Jan-2015-16**
**RANDOM VARIABLES AND STOCHASTIC PROCESSES**
(Electronics and Communications Engineering)

Time: 3 hours Max. Marks: 70

Note: 1. Question Paper consists of two parts (**Part-A** and **Part-B)**
2. Answer **ALL** the question in **Part-A**
3. Answer any **THREE** Questions from **Part-B**

~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~

## PART-A

1. a)Write the properties of Density Function
   b) Define characteristics Function and mention advantages of this function
   c) Joint Sample Space has three elements (1, 1), (2, 2), and (3, 3) with probabilities 0.4, 0.3, 0.3 respectively then draw the Joint Distribution Function diagram
   d) Write the properties of Cross correlation Function of Random Process
   e) Write the properties of cross power density spectrum
   f) What is mean value of output response of LTI system?

## PART-B

2. a) A Gaussian random variable X has $a_X = 2, and \sigma_X = 2$
   i) Find $P\{X > 1.0\}$
   ii) Find $P\{X \le -1.0\}$
   b) Define conditional probability distribution function and write the properties

3. a) Let X be a Poisson random variable then Find out its mean and variance
   b) A random variable X is uniformly distributed on the interval $(-\pi/2, \pi/2)$. X is transformed to the new random variable Y = T (X) = $a$ tan (X), where $a > 0$. Find the probability density function of Y.
~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~

4. a) Define Marginal density function? Find the Marginal density functions of below joint density function.

$$f_{XY} = \frac{1}{12} u(x)\, u(y)\, e^{-x/3} e^{-y/4}$$

b) Find the density function of W=X+Y, where the densities of X and Y are assumed to be: $f_x(x)=4u(x)e^{-4x}$; $f_y(y)=5u(y)e^{-5y.}$

5. a) Define a random process by X($t$) = A cos ($\pi t$), where A is a Gaussian random variable with zero mean and variance $\sigma_A^2$. Find the density functions of X(0) and X(1). Is X($t$) stationary?

b) A gaussian random process is known to be a WSS process with mean $\overline{X} = 4$ and $R_{XX}(\tau) = 25e^{-3|\tau|}$ where $\tau = \frac{|t_k - t_i|}{2}$ and i, k = 1,2. Find joint Gaussian density function?

6. a) Derive the relationship between power spectrum and autocorrelation

b) If X(t) is a stationary process, find the power spectrum of $Y(t) = A_0 + B_0 X(t)$ in term of the power spectrum of X(t) if $A_0$ and $B_0$ are real constants

7. A system's power transfer function is

$$|H(\omega)|^2 = \frac{16}{256 + \omega^4}$$

a) What is its noise bandwidth?

b) If white noise with power density 6(10-3)W/Hz is applied to the input, find the noise power in the system's output ?