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

II B. Tech II Semester Supplementary Examinations, April-2018
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**

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PART –A

1. a) Write the properties of Density function

b) Find the characteristic function of Uniform random variable X.

c) Joint Sample Space has three elements (1, 1), (2, 1), and (3, 3) with probabilities 0.4, 0.3, 0.2 respectively. Draw the Joint Distribution Function.

d) Define Ergodicity.

e) Write the properties of cross power density spectrum

f) How is the autocorrelation function of white noise represented? What is its significance?

PART -B

2. a) A random voltage can have any value defined by the set 'S' = {a ≤ s ≤ b}. A quantizer, divides S into 6 equal-sized contiguous subsets and generates random variable X having values {-4, -2, 0, 2, 4, 6}. Each value of X is earned to the midpoint of the subset of 'S' from which it is mapped
i)Sketch the sample space and the mapping to the line that defines the values of X
ii) Find a and b?

b) Explain Gaussian random variable with neat sketches?

3. a) A random variable X has a probability density

$$f\ x(x)=\begin{cases}(1/2)\cos(x) & -\pi/2<x<\pi/2\\ 0 & elsewhere\ in\ x.\end{cases}$$

Find the mean value of the function, $g(X)=4X^2$

b) A random variable X can have -4, -1, 2, 3 and 4 each with probability $\frac{1}{5}$ .find density function, mean, variance of the random variable $Y=3X^3$.

4. a) Define random variables V and W by V=X+aY, W=X-aY, Where a is real number and X and Y random variables. Determine a in terms of X and Y such V and W are orthogonal?

b) Two random variables have joint characteristic function
$\emptyset_{XY}(\omega_1, \omega_2)=\exp(-2\omega_1^2-8\omega_2^2)$. Find moments m_{10}, m_{01}, m_{11}?
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5. A random process $X(t)$ has periodic sample functions as show in figure ; where B, T and $4t_0 \leq T$ are constants but $\in$ is a random variable uniformly distributed on the interval (0, T). Find first order density function and distribution function of $X(t)$.

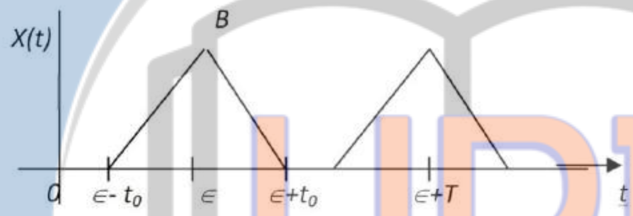

Figure-1

6. a) Assume X (t) is a wide-sense stationary process with nonzero mean value. Show that $S_{XX}(\omega) = 2\pi\bar{X}^2\delta(\omega) + \int_{-\infty}^{\infty} C_{XX}(\tau)e^{-j\omega\tau}d\tau$ where $C_{XX}(\tau)$ is the auto covariance function of X(t).

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) Write notes on generalized Nyquist theorem

b) Prove the output power spectral density equals the input power spectral density multiplied by the squared magnitude of the transfer functions of the filter.