Code No: R1621045   **R16**   SET - 1

II B. Tech I Semester Supplementary Examinations, May - 2018
RANDOM VARIABLES & STOCHASTIC PROCESSES
(Electronics and Communication 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 **FOUR** Questions from **Part-B**
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PART –A

1. a) In a single throw of three dice, find the probability of getting the same number on three dice. (2M)

    b) Define moment generating function of a random variable X. (2M)

    c) X and Y are two independent random variables with E[X] = 4, E[Y] = 6. Find E[4X-2Y] (2M)

    d) When a random process is called SSS process? Explain (3M)

    e) Determine whether the power density spectrum shown below is valid or not? (3M)

    $$\frac{\omega^2}{\omega^6 + 3\omega^2 + 3}$$

    f) Define effective noise temperature. (2M)

PART -B

2. a) Define a discrete random variable and discuss the characteristics of Poisson random variable using its probability density and distribution functions. (5M)

    b) Define probability distribution function and write its properties. (4M)

    c) A random variable X has pdf shown below. i) Find the value of k. ii) Find P(1/4 < X < ½). (5M)

    $$f_X(x) = \begin{cases} kx & 0 < x < 1 \\ 0 & elsewhere \end{cases}$$

3. a) A random variable X has a probability density (7M)

    $$f_X(x) = \begin{cases} (\pi/16)\cos(\pi x/8) & -4 \le x \le 4 \\ 0 & elsewhere \end{cases}$$

    Find its variance.

    b) A random variable X has pdf $f_X(x) = (1/b)e^{-(x-a)/b}$. Find its characteristic function. (7M)

4. a) Find the marginal densities of the joint density (7M)

    $$f_{XY}(x, y) = \begin{cases} b(x+y)^2 & -2 < x < 2 \text{ and } -3 < y < 3 \\ 0 & elsewhere \end{cases}$$

    b) Two random variables X and Y have joint characteristic function $\phi_{XY}(\omega_1, \omega_2) = \exp(-2\omega_1^2 - 8\omega_2^2)$. Show that X and Y are zero mean uncorrelated random variables. (7M)

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5. a) Write short notes on Gaussian random process.   (7M)

    b) Given the random process $X(t) = A\cos\omega_o t + B\sin\omega_o t$, where ω_o is a constant   (7M)
        and A, B are uncorrelated zero ,mean random variables with equal variances.
        Prove that $X(t)$ is wide sense stationary.

6.   Derive the relationship between cross correlation function and cross power   (14M)
        spectrum.

7. a) Write in detail about resistive noise source.   (8M)

    b) Obtain the mean value of the response of a LTI system excited by random   (6M)
        process $X(t)$.