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

II B. Tech I Semester Supplementary Examinations, October/November - 2020
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) Ten unbiased coins are thrown simultaneously. Find the probability of getting at least seven heads. (2M)
   b) Write Chebyschev's inequality. (2M)
   c) Define marginal distribution function. (2M)
   d) When a random process is called ergodic process? Explain (3M)
   e) Determine whether the power density spectrum shown below is valid or not? (3M)

$$\frac{\omega^4}{j\omega^6+\omega^2+1}$$

   f) Define average noise figure. (2M)

PART -B

2. a) Discuss the salient features of a binomial random variable using relevant distribution and density functions. Also discuss its typical application. (5M)
   b) Define probability density function and write its properties. (4M)
   c) The number of cars arriving at a certain bank during any 10 minute period is a Poisson random variable with b = 2. Find the probability that more than three cars will arrive during any 10 minute period. (5M)

3. a) Find the mean of Rayleigh random variable. (7M)
   b) A random variable has a probability density (7M)

$$f_X(x) = \begin{cases} \left(\frac{5}{4}\right)(1-x^4) & 0 < x \le 1 \\ 0 & else\ where \end{cases}$$ Find i) E[4X+2] ii) E[X^2]

4. a) Find value of constant b such that function shown below is a valid joint density (7M)
   $f_{XY}(x,y) = bx^2 y\exp(-2xy)u(x-2)u(y-1)$.
   b) Consider the linear transformations $Y_1 = 2X_1+3X_2$, $Y_2 = 4X_1-X_2$, find the joint density of Y_1,Y_2 in terms of joint density of X_1,X_2. (7M)

5. a) Classify random processes and explain. (7M)
   b) Define cross correlation function and write its properties. (7M)

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6. Derive the expression for cross power density spectrum and write its properties. (14M)

7. a) Write the properties of narrow band noise. (8M)

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