

II B. Tech I Semester Supplementary Examinations, May - 2019
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**

PART -A

1. a) A jar contains two white and three black balls. A sample of size 4 is made. (2M)
 What is the probability that the sample is in the order white, black,white,black?
- b) Define characteristic function of a random variable X. (2M)
- c) Define marginal density function. (2M)
- d) Define random process. (3M)
- e) Determine whether the power density spectrum shown below is valid or not? (3M)

$$\frac{\cos 3\omega}{\omega^2 + 1}$$
- f) Write the expression for average noise figure of cascaded networks. (2M)

PART -B

2. a) Discuss the significance of a Gaussian random variable using its probability density and distribution functions. (5M)
- b) Define conditional distribution function and write its properties. (4M)
- c) The life time of a system expressed in weeks is a Rayleigh random variable X (5M)
 with its distribution function $F_X(x) = e^{-x^2/400}$. What is the probability that a system lifetime will exceed one year.
3. a) Find the variance of a random variable with uniform density function. (7M)
- b) A random variable X has pdf $f_X(x) = (1/b)e^{-(x-a)/b}$. Find its moment function (7M)
 and use it to generate first order moment about origin.
4. a) X and Y are two independent random variables related to W as $W = X+Y$. Find (7M)
 $f_W(w)$ in terms of $f_X(x)$ and $f_Y(y)$.
- b) Two random variables X and Y have the joint density (7M)

$$f_{XY}(x, y) = \begin{cases} \frac{xy}{9} & 0 < x < 2, 0 < y < 3 \\ 0 & \text{else where} \end{cases}$$
. Show that X and Y are uncorrelated and also statistically independent.
5. a) Define autocorrelation function of a random process. Also write the properties (7M)
 of autocorrelation of a WSS process.
- b) A random process is defined as $X(t) = 4\cos(t + \Theta)$, where Θ is uniformly (7M)
 distributed random variable in $(0, 2\pi)$. Check whether $X(t)$ is WSS or not?

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SET - 1

6. State and prove Wiener-Khintchine relations. (14M)
7. a) Derive the relation between input and output PSDs of an LTI system. (8M)
- b) Write short notes on thermal noise. (6M)

