

**PRAGATI ENGINEERING COLLEGE: SURAMPALEM
(AUTONOMOUS)**

II B.Tech II Semester Regular/Supplementary Examinations, May-2024

**RANDOM VARIABLES AND STOCHASTIC PROCESSES
(ECE)**

Time: 3 hours

Max. Marks: 70

**Answer ONE Question from each Unit
All Questions Carry Equal Marks**

Q. No.	Questions	BTL	CO	Marks
UNIT – I				
1.	a) Define Conditional distribution function and State all its properties.	K2	CO1	7M
	b) If the continuous density function of a random variable X is given by $f(x) = \begin{cases} \frac{x^2}{3}; & 0 \leq x \leq 2 \\ 0; & \text{otherwise} \end{cases}$ Find P(0<X<1) and F _x (x)?	K3	CO1	7M
OR				
2.	a) Describe the following density functions with neat sketches i) Gaussian ii) Rayleigh	K2	CO1	7M
	b) What is meant by random variable? Classify and explain different random Variables.	K2	CO1	7M
UNIT – II				
3.	a) State and prove Markov's inequality	K2	CO2	7M
	b) Define Moment generating function of random variable and explain its properties,	K2	CO2	7M
OR				
4.	a) Explain non-monotonic transformation of a continuous random variables.	K2	CO2	7M
	b) The density function of a random variable is given as $f_X(x) = ae^{-bx} \quad x \geq 0,$ Find the characteristic function and the first two moments	K3	CO2	7M
UNIT – III				
5.	a) Define Joint characteristics function of two variables and state its properties	K1	CO3	7M
	b) X and Y are statistically independent random variables and $W = X + Y$, Find $f_W(w)$.	K2	CO3	7M
OR				
6.	a) If X and Y are independent, show that $E[XY]=E[X] E[Y]$.	K2	CO3	7M
	b) Two random variables X and Y have mean values $\bar{X}=1$, $\bar{Y}=1$, $\sigma_X^2=4$, $\sigma_Y^2=2$ and $\rho_{xy}=0.2$. Define two new random variables $V=-X-Y$, $W=2X+Y$. Find a) Correlation of V and W and b) Correlation coefficient ρ_{vw} of V and W.	K3	CO3	7M

UNIT – IV

7.	a)	What is meant by random process? Classify and explain.	K2	CO4	7M
	b)	A random process $Y(t)=X(t)-X(t+\tau)$ is defined in terms of a process, $X(t)$ that is at least WSS. a) Show that the mean values of $Y(t)$ are zero even if $X(t)$ has a non-zero mean value. b) Show that $\sigma_Y^2 = 2 [R_{XX}(0) - R_{XX}(\tau)]$ If $Y(t)=X(t)+X(t+\tau)$, Find $E[Y(t)]$ and σ_Y^2	K2	CO4	7M

OR

8.	a)	Define cross correlation function of two random process $X(t)$ and $Y(t)$ and state the properties of cross correlation function	K1	CO4	7M
	b)	The autocorrelation function of a stationary random process $X(t)$ is given by $R_{XX}(\tau) = 36 + \frac{16}{1+8\tau^2}$ Find mean, mean square and variance of the process.	K3	CO4	7M

UNIT – V

9.	a)	Explain the following random processes (i) Band pass (ii) Band limited (iii) Narrow band	K2	CO5	7M
	b)	Derive power spectrum function of output of a random process	K2	CO5	7M

OR

10.	a)	A random process $X(t)$ has the power spectral density $S_{XX}(\omega) = \frac{9}{\omega^2 + 64}$ Find i) The average power of the process ii) The Auto correlation function.	K3	CO5	7M
	b)	Define and derive the Wiener-Kinchen relations	K2	CO5	7M