K. J. Somaiya Institute of Engineering and Information Technology, Sion, Mumbai-22

(Autonomous College Affiliated to University of Mumbai)

End Semester Exam

Nov – Dec 2021__

Program: _ B.Tech ________

Examination: TY Semester: V

Course Code: 1UEXC504 _____and Course Name: _ Random Signal Analysis ___

Duration: 03Hours
Max. Marks: 60

Instructions:

(1)All questions are compulsory.

(2)Draw neat diagrams wherever applicable.

(3)Assume suitable data, if necessary.

		Max. Marks	CO	BT level
Q 1	**Solve any six questions out of eight:**	**12**		
i)	Explain conditional probability of Event	02	CO 1	U
ii)	Define continuous and Discrete random variable.	02	CO 2	R
iii)	A hospital switch board receives an average of 4 emergency calls in a 10 minutes interval. Compute the probability that there are at most 2 emergency calls?	02	CO 3	Ap
iv)	Calculate probability that at most 4 defective bulbs	02	CO 3	Ap

	will be found in a box of 200 bulbs if it is known that 2 % of the bulbs are defective. (Given e^{-4}=0.0183)			
v)	Define characteristic function for discrete probability distribution and continuous probability distribution	02	CO 4	R
vi)	What is covariance and Correlation of two random variables X and Y.	02	CO 4	R
vii)	What is Random Process with an example.	02	CO 5	R
viii)	Define Markov Chain with example.	02	CO 6	R
Q.2	**Solve any four questions out of six.**	**16**		
i)	State and Explain Bayes theorem	04	CO 1	R,U
ii)	Define probability Density function and states its three properties	04	CO 2	R
iii)	Let X be a continuous random variable with uniform probability density function in $(0,2\pi)$. Compute the probability density function and distribution function of Y=cosX.	04	CO 3	Ap
iv)	If X= cos θ ,Y=sin θ , where θ is uniformly distributed over (0.2π),show that X and Y are not correlated.	04	CO 4	Ap
v)	A random process is given by $x(t)=A\cos(w_0 t+\theta)$ where A and w_0 are constant and θ is uniformly distributed over $(0,2\pi)$, show that random process x(t) is wide sense stationary process.	04	CO 5	Ap
Vi)	Explain Markov process.	04	CO 6	U
Q.3	**Solve any two questions out of three.**	**16**		
i)	In communication system, a zero is transmitted with probability 0.4 and one is transmitted with probability 0.6 Due to noise in channel, a zero can be received as one with probability 0.1 and a zero	08	CO 1	Ap

	can be received as zero with probability 0.9 ,similarly one can be received as zero with probability 0.1 and a one can be received as one with probability 0.9 .compute probability that i) a 1 is received ii) a 0 is received iii) a zero was transmitted given that one is observed iv)) a one was transmitted given that one is observed.			
ii)	The joint probability density function of two dimensional random variable (X,Y)is given by $f(x,y)=4xy\ e^{-(x2+y2)}, x\geq 0, y\geq 0$ i)Estimate the marginal density functions of X and Y ii)compute conditional density function of Y given that X=x and the conditional density function of X given that Y=y.	08	**CO** 4	Ap
iii)	A random process is given by $X(t)=\sin(wt+Y)$ where Y is uniformly distributed in $(0,2\pi)$. Identify whether $\{X(t)\}$ is a wide sense stationary process.	08	**CO** 5	Ap
Q.4	**Solve any two questions out of three.**	**16**		
i)	Estimate Mean, variance and Moment Generating function of Poisson distribution	08	**CO** 2	Ap
ii)	Compute the characteristic function of $f(x)=(1/b)*e^{-(x-a)/b}$, $x\geq a$ $= 0$, $x<a$ Also compute its mean and variance. Explain any four properties of characteristic function	08	**CO** 3	Ap
iii)	The transition probability matrix of a Markov chain with three states 0,1,2 is given by 0 1 2 P= And the initial state distribution is P(Xo=i)=[1/3 1/3 1/3],i=0,1,2. Compute i) $P(X_2=2)$ ii)$P[X_3=1, X_2=2, X_1=1, X_0=2]$	08	**CO** 6	Ap