K. J. Somaiya Institute of Technology, Sion, Mumbai-22
(Autonomous College Affiliated to University of Mumbai)

Nov – Dec 2025	
.Program: _ B. Tech__ Scheme IIB | II	
Backlog Regular/Supplementary Examination: TY Semester :V	
Course Code: EXC504 and Course Name: Random Signal Analysis	
Date of Exam: 3/12/25 Duration: 02.5 Hours Max. Marks: 60	

Instructions:
(1)All questions are compulsory.
(2)Draw neat diagrams wherever applicable.
(3)Assume suitable data, if necessary.

Q. No.	Question	Max. Marks	CO	BT level
Q 1	Solve any **two** questions out of three: (05 marks each)	10		
a)	A certain test for a particular cancer is known to be 95% accurate .A person submits to the test and the result is positive. Suppose that a person comes from a populations of 1, 00,000 where 2000 people suffer from that disease. Compute probability that the person under test has that particular cancer		1	Ap
b)	.A random variable has the following exponential probability density function: $f(x)=Ke^{-|x|}$. Determine the value of K.		2	Ap
c)	If probability density function of X is $f(x) = e^{-x}$, x>0 . Compute probability density function of $Y=\sqrt{x}$		3	Ap
Q 2	Solve any **two** questions out of three: (05 marks each)	10		
a)	If X=cos θ , Y = sin θ ,where θ is uniformly distributed over (0,2π) prove that i) X and Y are uncorrelated		4	Ap
b)	state five properties of autocorrelation function.		5	U
c)	Transition probability(p) of matrix of a Markov chain with three states 1,2,3 is given by $$\begin{bmatrix} 0.5 & 0.4 & 0.1 \\ 0.3 & 0.4 & 0.3 \\ 0.2 & 0.3 & 0.5 \end{bmatrix}$$ Compute Steady state probabilities.		6	Ap

	Nov – Dec 2025 .Program: _ B. Tech__Scheme IIB Regular/Supplementary Examination: TY Semester :V , Course Code: EXC504 and Course Name: Random Signal Analysis			
Date of Exam:	Duration: 02.5 Hours		Max. Marks: 60	

Q.3	Solve any **two** questions out of three. (10 marks each)	20		
a)	For a certain communication channel, Probability that '0' is received as '0' is 0.8 while probability that '1' is received as '1' is 0.95, if probability of transmitting '0' is 0.45. Then find i) a '1' is received ii) '1' was transmitted given that '1' was received. iii) probability that error has occurred.		1	Ap
b)	The joint pdf of random variable X,Y is given by $f(x,y) = k\ e^{-3x-5y}$. $X \geq 0, Y \geq 0$ $f(x,y) = 0$........ elsewhere a) Find value of k, b) Evaluate the marginal pdf of X and Y c) compute E[X/Y] and E[Y/X] d) Are X and Y are independent.		4	Ap
c)	If a random process $\{x(t)\}$ is given by $X(t) = A \cos (W_o t + \theta)$ where θ is uniformly distributed over $(-\pi, \pi)$,prove that $\{x(t)\}$ is correlation ergodic.		5	Ap
Q.4	Solve any **two** questions out of three. (10 marks each)	20		
a)	X is a normal variate with mean 30 and standard deviation 5. Compute the probabilities that i) $26 \leq X \leq 40, ii) X \geq 45, iii)$ $|X - 30| \geq 5$. Solve using standard Normal Distribution table.		2	Ap
b)	If X and Y are two independent random variables and if Z=X / Y then compute the probability density function of Z.		3	Ap
c)	State and prove chapman Kolmogorov equation		6	U, Ap

****