



R20 Regulation

Subject code: 3P4DA

TKR COLLEGE OF ENGINEERING AND TECHNOLOGY

(Autonomous, Accredited by NAAC with 'A+' Grade)

B.Tech IV Semester Supplementary Examinations, February 2024

PROBABILITY THEORY AND STOCHASTIC PROCESSES
(ELECTRONICS & COMMUNICATION ENGINEERING)

Maximum Marks: 70

Date:16.02.2024 Duration: 3 hours

- Note:
1. This question paper contains two parts A and B.
 2. Part A is compulsory which carries 20 marks. Answer all questions in Part A.
 3. Part B consists of 5 Units. Answer any one full question from each unit which carries 10M.
 4. Each question carries 10 marks and may have a, b, c, d as sub questions.

Part-A

All the following questions carry equal marks (10x2M=20 Marks)		CO	Bloom Tx
1	In a group of 60 people, 27 like coffee and 42 like tea and each person likes at least one of the two. How many like both coffee and tea?	CO1	L1
2	Define Sample Space.	CO1	L1
3	List the properties of distribution function.	CO2	L1
4	The joint probability mass function of (X,Y) is given by $p(x, y) = k(x+2y)$, $x=1,2,3, 4$; $y=0, 1,2$. Find the value of k.	CO2	L3
5	If a random variables X has the moment generating function $M_x(t) = \frac{2}{2-t}$, find $E[X]$.	CO3	L3
6	Define joint characteristic function.	CO3	L1
7	Define wide-sense stationary process.	CO4	L1
8	Define Cross-Correlation function.	CO4	L1
9	Write any two properties of cross power density spectrum.	CO5	L1
10	The power spectral density of a random process X(t) is given by $S_{XX}(\omega) = \begin{cases} \pi, & \omega < 1 \\ 0, & \text{elsewhere} \end{cases}$. Find its autocorrelation function.	CO5	L3

Part-B

Answer All the following questions. (5X10M=50Marks)			
11	In a group of 100 persons, 72 people can speak English and 43 can speak French. i. How many can speak English only? ii. How many can speak French only? iii. How many can speak both English and French? [10]	CO1	L1
OR			
12	In a binary communication system a zero and a one is transmitted with probability 0.6 and 0.4 respectively. Due to error in the communication system a zero becomes a one with a probability 0.1 and a one becomes a zero with a probability 0.08. Determine the probability (i) of receiving a one and (ii) that a one was transmitted when the received message is one. [10]	CO1	L3

13	A random variable X has the following probability distribution. [10] <table><tr><td>x</td><td>0</td><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td><td>6</td><td>7</td><td>,</td></tr><tr><td>P(x)</td><td>0</td><td>k</td><td>2k</td><td>2k</td><td>3k</td><td>k²</td><td>2k²</td><td>7k² + k</td><td></td></tr></table> Find (i) the value of k (ii) P(x < 5) and P(1 < x < 6) (iii) the distribution function of X . (iv) mean and variance of X.	x	0	1	2	3	4	5	6	7	,	P(x)	0	k	2k	2k	3k	k ²	2k ²	7k ² + k		CO2	L3
x	0	1	2	3	4	5	6	7	,														
P(x)	0	k	2k	2k	3k	k ²	2k ²	7k ² + k															
	OR																						
14	The joint probability mass function of (X, Y) is given by P(x, y) = K(2x + 3y), x = 0, 1, 2 ; y = 1, 2, 3. Find i) the marginal distributions of X and Y ii) the conditional probability of X given Y=1 [10]	CO2	L3																				
15	The density function of a random variable X is given by f(x) = kx(2 - x), 0 ≤ x ≤ 2. Find k, mean and variance. [10]	CO3	L3																				
	OR																						
16	If the joint pdf of (X, Y) is given by f_{XY}(x, y) = e^{-(x+y)} ; x ≥ 0 , y ≥ 0 , find the pdf of U = $\frac{X+Y}{2}$. [10]	CO3	L3																				
17	Verify whether the sine wave random process X(t) = Ysinωt, Y is uniformly distributed in the interval -1 to 1 is WSS or not. [10]	CO4	L5																				
	OR																						
18	Consider the random process X(t) with X(t) = A cos(A²t + φ), where φ is a uniformly distributed random variable in (-π, π). Prove that X(t) is correlation ergodic. [10]	CO4	L5																				
19	Find the power spectral density of the random process whose auto correlation function is R(τ) = $\begin{cases} 1 - \tau , & \tau \leq 1 \\ 0, & \text{elsewhere} \end{cases}$ [10]	CO5	L3																				
	OR																						
20	The cross- power spectrum of real random process X(t) and Y(t) is given by S_{XY}(ω) = $\begin{cases} a + jb\omega, & \omega < 1 \\ 0, & \text{elsewhere} \end{cases}$. Find the cross correlation function. [10]	CO5	L3																				