DEPARTMENT OF MATHEMATICS

Sub Code:	CS/IS/CY/CI41	Sub:	Statistics, probability and Linear Programming.	Section:	CS/IS/CI/CY
Semester:	IV	Term:	15/04/2024 to 27/07/2024	Marks:	30
Date:	23/07/2024	Time:	2:00 to 3:00 pm	Test:	T2

Note: Answer any TWO full questions. Each main question carries 15 marks

Q. No.		Questions	Bloom Level	CO's	Marks
1	(a)	Define feasible solution of the LPP.	L1	CO5	2
	(b)	Two sample sizes 8 and 7 give the sum of squares of deviations from their respective means equal to 34 and 24 respectively. Test the hypothesis that the populations have the same variance.	L2	CO4	3
	(c)	There are 2 white marbles in bag A and 2 red marbles in bag B. At each step of the process a marble is selected at random from each bag and the two marbles selected are interchanged then find (i) transition probability matrix (ii) what is the probability that there are 2 red marbles in A after long run.	L3	CO3	5
	(d)	A fertilizer mixing machine is set to give 12 kg of nitrate for quintal bag of fertilizer. Ten 100 kg bags are examined, the percentage of nitrate per bag are as follows: 11, 14, 13, 12, 13, 12, 13, 14, 11, 12. Are there any reasons to believe that the machine is defective?	L4	CO4	5
2	(a)	Define level of significance.	L1	CO4	2
	(b)	A man rides his motorcycle at the speed of 50 km/hour. He has to spend Rs 2 per km on petrol. If he rides it at a faster speed of 80 km/hour, the petrol cost increases to Rs 3 per km. He has at most Rs 120 to spend on petrol and one hour's time. He wishes to find the maximum distance that he can travel. Express this problem as a linear programming problem.	L2	CO5	3
	(c)	In a city airport, flights arrive at a rate of 24 flights per day. It is known that the inter-arrival time follows an exponential distribution and the service time distribution is also exponential with an average of 30 minutes. Find (i) The probability that the system will be idle (ii) The mean queue size (iii) The average number of flights in the queue.	L3	CO3	5
	(d)	Among 64 offspring of a certain cross between Guinea pigs 34 were red, 10 were black and 20 were white. According to the genetic model these numbers should be in the ratio 9:3:4. Are the data consistent with the model at 5% level of significance?	L4	CO4	5
3	(a)	Write the expression to determine the expected number of customers in the system for (M/G/1) queueing model.	L1	CO3	2
	(b)	Find the fixed probability vector of the matrix $\begin{bmatrix} 0 & 1 \\ \frac{1}{2} & \frac{1}{2} \end{bmatrix}$	L2	CO3	3
	(c)	A bag contains three tickets numbered 1, 3 and 5. Two tickets were drawn at random one after the other with replacement. List all possible samples of size 2. Find (i) mean of population (ii) mean of sample (iii) Sample S D (iv) population S D.	L3	CO4	5
	(d)	Solve the following linear programming problem graphically, minimize $z = 200x + 500y$ subject to the constraints $x + 2y \geq 10$, $3x + 4y \leq 24$, $x \geq 0, y \geq 0$	L5	CO5	5