End Semester Exam
MAY-JUNE 2021

Max. Marks: 50
Duration: 1 Hr. 45 Min.+(15 for uploading)
Class: SY   Semester: IV

Name of the Course: Probability, Statistics and Optimization
Techniques   Branch: COMP/IT
Course Code:2UCC401/ 2UIC401

Instructions:
1. **All questions are compulsory**
2. **Draw neat diagrams**
3. **Assume suitable data if necessary**

Q.N0		Question	Max Marks
1(A)		**1. All questions are compulsory.** **2. Each question carries 2 marks**	

	1	Mention whether the following statements are True(T) or False(F):
		(i)Correlation coefficient is zero means that the variables are not associated.
		(ii)Coefficients of Regressions are independent of change of scale but not of change of origin.
		    (a) (T, T)
		    (b) (T, F)
		    (c) (F, F)
		    (d) (F,T)
			2

	2	For a Uniform variate X, mean and variance are 15/2 and 25/12 respectively. Find $P(6 \leq X \leq 8)$
		  (a) 0.4
		  (b) 0.2
		  (c) 0.28
		  (d) 0.56
			2

	3	A purse contains 3 silver coins and 4 copper coins. Second purse contains 4 silver and 3 copper coins. If a coin is selected at random from one of the two purses, find the probability that it is a silver coin
		  (a) 19/42
		  (b) 1/3
		  (c) 2/7
		  (d) 5/6
			2

	4	A and B throw a fair dice for a stake of Rs 44, which is won by the player who throws 6 first. If A starts first, find expectation of A
		  (a) 6/11
		  (b) 5/11
		  (c) 24
		  (d) 20
			2

	5	In a bank customer arrive at a counter, being manned by a single individual, according to a Poisson input process with a mean rate of 30 per hour. The time required to serve a customer has an exponential distribution with a mean of 90 seconds. Find the average queue length. (a) 2 (b) 3 (c) 5 (d) 6	2
1(B)		**1. Attempt any FIVE of the following.** **2. Each question carries 2 marks**	
	1	Find the constant c if X and Y be jointly continuous variables with joint pdf $$f_{X,Y}(x,y) = \begin{cases} cx + 1 & x,y \geq 0, x + y < 1 \\ 0 & otherwise \end{cases}$$	2
	2	A survey was conducted for some students to find the number of hours each student spent in daily studying and whether they passed or failed. Logistic modal is given as follows: Log (odds of passing exam) = 1. 5046.hours - 4.0777 If standard error is 0.564, Find 95% confidence interval for the slope	2
	3	The mean lifetime of a sample of 100 fluorescent light bulbs produced by a company is computed to be 1570 hours with a standard deviation of 120 hours. company claims that the average life of bulbs produced by it is 1600 hours. Compute the test statistic to test whether the company's claim is acceptable.	2
	4	Find the pivot element in the first simplex table for the solution of following LPP Maximize $z = 3x_1 - x_2$ Subject to $2x_1 + x_2 \leq 2$ $\qquad x_1 + 3x_2 \geq 3$ $\qquad x_2 \leq 4$ $\qquad x_1, x_2 \geq 0$	2
	5	Convert the following LPP in the Standard form Maximize $z = 3x_1 + 4x_2 - 2x_3$ Subject to $6x_1 - 4x_2 \leq 5$ $\qquad 3x_1 + x_2 + 4x_3 \geq 11$ $\qquad 4x_1 + 3x_2 \leq 2$ $\qquad x_1, x_2, x_3 \geq 0$	2
	6	Find the values of D_1 , D_2 and D_3 in the solution of following NLPP $z = x_1 + 2x_3 + x_2x_3 - x_1{}^2 - x_2{}^2 - x_3{}^2$	2
	7	A mechanic finds that the time spent on his jobs has an exponential distribution with a mean of 30 min. and if the arrival of defective items follows a Poisson distribution with an approximate average rate of 10 per 8 hours day. Find the probability that the total waiting time of repair of a defective item in the system is more than 2 hours	2

2	A	**(i)** If the height of 500 students is normally distributed with mean 68 inches and standard deviation 4 inches. Find the expected number of students having heights: i) greater than 72 inches, ii) less than 62 inches	6
		OR	
		(ii) Three fair coins are tossed. Find the expectation and the variance of the number of heads.	6
	B	The coefficient of rank correlation of the marks obtained by 10 students in Physics and chemistry was found to be 0.5. It was later discovered that the difference in ranks in the two subjects obtained by one of the students was wrongly taken as 3 instead of 7. Find the correct coefficient of rank correlation.	4
3	A	**(i)** Ten boys were given a test in statistics & their scores were recorded. They were given a month's special coaching & a second test was given to them in the same subject at the end of the coaching period. Test if the marks given below give evidence to the fact that coaching benefits the students Marks in test1: 70, 68, 56, 75, 80, 90, 68, 75, 56, 58 Marks in test2: 72, 70, 58, 76, 79, 92, 80, 90, 54, 59	6
		OR	
		(ii) The theory predicts the proportion of beans in the four groups A, B, C, D. It should be 9:3:3:1. In an experiment among 1600 beans, the numbers in the four groups were 882, 313, 287 and 118. Does the experimental result support the theory?	6
	B	A petrol station has a single pump and space for not more than 3 cars (2 waiting, 1 being served). Cars arriving to a Poisson distribution at a mean rate of one every 8 minutes. This service time has an exponential distribution with a mean of 4 minutes. Find the time that a car spends at the petrol station.	4
4	A	Using Dual simplex method Solve the following linear programming problem Minimize $z = 2x_1 + 2x_2 + 4x_3$ Subject to $2x_1 + 3x_2 + 5x_3 \geq 2$ $\qquad\qquad 3x_1 + x_2 + 7x_3 \leq 3$ $\qquad\qquad x_1, x_2, x_3 \geq 0$	6
	B	Solve the following NLPP Optimize $z = 6x_1 + 8x_2 - x_1{}^2 - x_2{}^2$ Subject to $4x_1 + 3x_2 = 16$ $\qquad\qquad x_1, x_2 \geq 0$	4