K. J. Somaiya College of Engineering, Mumbai-77
(Autonomous College Affiliated to University of Mumbai)

End Semester Exam(KT 2014)
MAY-JUNE 2021

Max. Marks: 50
Duration: 1 Hr. 45 Min.+(15 for uploading)
Class: SY Semester: IV
Name of the Course: AM-IV Branch: COMP
Course Code:UCEC401

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	If two regression coefficients are (-0.1) and (-0.9), the value of coefficient of correlation is (a) -0.03 (b) -0.3 (c) 0.03 (d) 0.3	2
	2	A random variable X is said to follow exponential distribution with parameter λ if its p.d.f. probability density function is of the form (a) $f(x) = \lambda e^{-\lambda x}$, $x \geq 0$ and $\lambda \geq 0$ (b) $f(x) = -\lambda e^{-\lambda x}$, $x \geq 0$ and $\lambda \geq 0$ (c) $f(x) = \lambda e^{\lambda x}$, $x \geq 0$ and $\lambda \geq 0$ (d) $f(x) = -\lambda e^{\lambda x}$, $x \geq 0$ and $\lambda \geq 0$	2
	3	If X is normal variate with mean 3 and standard deviation 4, then what is $P(4 \leq X \leq 8)$? (a) 0.2957 (b) 0.3944 (c) 0.0987 (d) 0.4931	2
	4	If X is Binomial variate with mean 3 and variance= 4/3 , then probability p is (a) 1/2 (b) 0 (c) 1/3 (d) 1	2

	5	The average number of customers in the system if the system is (M/M/1/∞) and $\mu = 15, \lambda = 10$ (a) 2 (b) 3 (c) 5 (d) 1	2
1(B)		**1. Attempt any FIVE of the following.** **2. Each question carries 2 marks**	
	1	For a random sample of 625 items having mean 10 and standard deviation 1.5, find 95% confidence limits.	2
	2	Accidents occur on a particular stretch of highway at an average rate 3 per week. What is the probability that there will be exactly two accidents in the week?	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.	2
	4	The regression lines of sample are $6Y = 5X + 90, 15X = 8Y + 130$, then sample means are (a)$-30, 40$ (b) $-40, 30$ (c) $30, 40$ (d))$-30, -40$	2
	5	Convert the following LPP in the Standard form Maximize $z = 3x_1 + 4x_2 - 2x_3$ Subject to $6x_1 - 4x_2 \leq 5$ $3x_1 + x_2 + 4x_3 \geq 11$ $4x_1 + 3x_2 \leq 2$ $x_1, x_2, x_3 \geq 0$	2
	6	Find the Hassian Matrix 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	The local one-person barber shop can accommodate maximum of 5 people at a time (4 waiting and 1 getting haircut). Customers arrive according to a Poisson Distribution with mean 4 per hour. The barber cuts hair according to an Exponential Distribution at an average rate of 4 per hour. Find idle time of barber.	2
2	A	**(i)** The marks obtained by students in a certain examination follow a normal distribution with a mean 70 and standard deviation 5. Find the probability for students scoring more than 75 marks	6
		OR	
		(ii)	6

		Three fair coins are tossed. Find the probability distribution of the number of heads and their expectation.	
	B	Calculate coefficient of correlation. <table><tr><td>X</td><td>12</td><td>13</td><td>14</td><td>15</td><td>16</td><td>17</td><td>18</td><td>19</td></tr><tr><td>Y</td><td>54</td><td>61</td><td>66</td><td>70</td><td>74</td><td>78</td><td>85</td><td>89</td></tr></table>	4
3	A	**(i)** The average of marks scored by 32 boys is 72 with standard deviation 8 while that of 36 girls is 70 with standard deviation 6. Test at 1% level of significance whether the boys perform better than the girls.	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 at 5% level of significance?	6
	B	Find service utilization factor and the average waiting time per customer in the queue for (M/M/1/∞) model if $\mu = 15, \lambda = 9$ per hour.	4
4	A	Solve the following linear programming problem by Simplex method Maximize $z = 10x_1 + x_2 + x_3$ Subject to $x_1 + x_2 - 3x_3 \leq 10$ $4x_1 + x_2 + 3x_3 \leq 20$ $x_1, x_2, x_3 \geq 0$	6
	B	**(i)** Construct the Dual of the following LPP Minimize $z = 3x_1 - 2x_2 + x_3$ Subject to $2x_1 - 3x_2 + x_3 \leq 5$ $4x_1 - 2x_2 \geq 9$ $-8x_1 + 4x_2 + 3x_3 = 8$ $x_1, x_2, x_3 \geq 0$	4
		OR	
		(ii) Using Lagrange's Multiplier method, Solve the following NLPP Optimize $z = 6x_1 + 8x_2 - {x_1}^2 - {x_2}^2$ Subject to $4x_1 + 3x_2 = 16$ $x_1, x_2 \geq 0$	