Reg. No.										

MANIPAL INSTITUTE OF TECHNOLOGY
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(A constituent unit of MAHE, Manipal)

MANIPAL INSTITUTE OF TECHNOLOGY

DEPARTMENT OF MATHEMATICS

IV SEMESTER B.TECH. (AUTOMOBILE ENGINEERING)

END SEMESTER EXAMINATION

Subject (Name & Code): Engineering Mathematics IV & MAT 2252

Date of Examination: 24-05-2023 Time: 2.30 PM-5.30 PM MAX.MARKS: 50

Q. No.	Question	M	CO	PO	BL
1A.	Determine whether the following data set mesokurtic: x: 1 2 3 4 5 6 7 8 0 $f(x)$: 8 28 56 70 56 28 8 1 1	**4**	**1**	**2**	**4**
1B.	The mean annual salary paid to all employees of a company was \$5000. The mean annual salaries paid to male and female employees were \$5200 and \$4200, respectively. Determine the percentage of males and females employed by the company.	**3**	**1**	**1**	**3**
1C.	Calculate the mean and standard deviation of the following frequency distribution: Size of item: 6 7 8 9 10 11 12 Frequency: 3 6 9 13 8 5 4	**3**	**1**	**1**	**3**
2A.	Calculate the coefficient of correlation and obtain the least square regression line of y on x for the following data: x: 1 2 3 4 5 6 7 8 9 y: 9 8 10 12 11 13 14 16 15	**4**	**2**	**1**	**3**
2B.	The two regression equations of the variables x and y are $x = 0.7y + 5.2$ and $y = 0.3x + 2.8$. Find (i) mean of x, (ii) mean of y and (iii) the correlation coefficient between x and y.	**3**	**2**	**1**	**3**
2C.	Let $X \sim B(N, p)$. Compute the generating function of X. Hence compute the expectation and variance of X.	**3**	**4**	**1**	**3**
3A	Maximize the objective function $z(x, y) = 2x + 4y$ subject to the constraints: $x + 2y \leq 5$ $x + y \leq 4$ $x, y \geq 0$	**4**	**6**	**1**	**3**

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3B	Show that the following LP has no feasible solution: Maximize $z = 3x + 2y$ subject to $2x + y \leq 2$ $3x + 4y \geq 12$ $x, y \geq 0.$	**3**	**6**	**1**	**3**
3C	Formulate the following problem as a linear programming model (no need to solve the LP model): Old hens can be bought for Rs.200.00 each but young one costs Rs.500.00 each. The old hens lay 3 eggs per week and young ones 5 eggs per week, each egg being worth Rs.3. A hen costs Rs.100.00 per week to feed. If you have only Rs.8000 to spend for purchasing the hens, then how many of each kind should you buy to have a maximum profit per week assuming that you cannot house more than 20 hens.	**3**	**6**	**2**	**4**
4A	Suppose that X is a random variable and has a Poisson distribution with parameter α. If $3P(X = 2) = 2\,P(X = 1)$, then calculate the parameter α. Also, calculate $P(X = 0)$ and $P(1 < X \leq 3)$.	**4**	**5**	**1**	**3**
4B	Show that the sum of two independent Poisson random variables is a Poisson random variable.	**3**	**4**	**1**	**3**
4C	Find an initial basic feasible solution of the following problem using VAM: 		D_1	D_2	D_3	D_4	Supply
O_1	5	3	6	2	19
O_2	4	7	9	1	37
O_3	3	4	7	5	34
Demand	16	18	31	25	| |	I	II	III	Demand
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A	1	2	6	7
B	0	4	2	12
C	3	1	5	11
Supply	10	10	10		 Find the optimal solution for the following transportation problem:	**3**	**6**	**1**	**3**
5A	Minimize the objective function $z(x, y) = 4x + y$ subject to the constraints: $3x + y = 3$ $4x + 3y \geq 6$ $x + 2y \leq 4$ $x, y \geq 0.$	**5**	**6**	**1**	**3**
5B	Find the optimal solution for the following transportation problem:	**5**	**6**	**1**	**3**