

3E1201	Roll No. _____	[Total No. of Pages : 4]
	3E1201	
	B.Tech. III-Sem. (Main & Back) Examination, January/February - 2024 Artificial Intelligence & Data Science 3AID2-01 Advanced Engineering Mathematics AID, CAI, CS, IT, CCS, CDS, CIT, CSD, CSR	

Time : 3 Hours

Maximum Marks : 70

Instructions to Candidates:

Attempt all Ten questions from Part-A, Five questions out of seven questions from Part-B and Three questions out of Five questions from Part-C.

Schematic diagrams must be shown wherever necessary. Any data you feel missing suitably be assumed and stated clearly. Units of quantities used/Calculated must be stated clearly.

Use of following supporting material is permitted during examination. (Mentioned in form No.205)

PART - A

(Answer should be given up to 25 words only)

All questions are compulsory.

(10×2=20)

1. What is the difference between linear and non-linear programming problem.
 2. What is optimization Technique? Give example.
 3. What is mean, variance and standard Deviation of Uniform Distribution and Exponential Distribution.
 4. Fit a straight line of following set of observation
- | | | | | | |
|---|---|---|---|---|----|
| x | 1 | 2 | 3 | 4 | 5 |
| y | 2 | 4 | 6 | 8 | 10 |
5. What is spearman rank correlation?
 6. Write the dual of

$$\text{Max } z = x_1 + 3x_2$$

$$\text{s.t. } 3x_1 + 2x_2 \leq 6$$

$$3x_1 + x_2 = 4$$

$$x_1, x_2 \geq 0.$$

ersahilkagyan.com

7. Find the maxima and minima of $x_1^3 + x_2^3 + 9x_1^2 + 18x_2^2 + 144$

8. Find all the basic solution of the system.

$$2x + y - z = 2$$

$$3x + 2y + z = 3$$

9. What is difference between skewness and kurtosis.

10. Find the optimal assignment for the problem with minimum cost.

	I	II	III	IV
A	5	3	1	8
B	7	9	2	6
C	6	4	5	7
D	5	7	7	6

PART - B

(Analytical/Problem solving questions)

Attempt any Five questions.

(5×4 =20)

1. Define Poisson Distribution. Derive it a limiting case of Binomial distribution Find the mean and Variance also.

2. The joint probability mass function of (X, Y) is given by

$$P_{XY}(x_i, y_j) = \begin{cases} \lambda x_i^2 y_j, & i=1,2; j=1,2,3 \\ 0 & \text{otherwise} \end{cases}$$

i) Find λ

ersahilkagyan.com

ii) Find the marginal probability mass function of x and y.

3. Old hens can be bought at Rs 2.00 with young. Ones at Rs 5.00 each. An old hen lays 3 eggs a young one 5 eggs a week. Each egg is sold for 30P. if the expenses incurred on their feeding be Rs 1.00 per hen per week, find how many hens of each kind a person having Rs.80 for investment can purchase to earn maximum profit, if he has accomodation only for 20 hens in his house.

4. Optimize $Z = x^2 + y^2 + z^2$

Subject to $4x + y^2 + 2z = 14$

5. Use simplex method to solve the LP problem

Maximize $Z = 4x_1 + 3x_2$

Subject to $2x_1 + x_2 \leq 10$

$3x_1 + 2x_2 \leq 16$

$x_1, x_2 \geq 0.$

ersahilkagyan.com

6. Obtain the optimal transportation plan from the following table.

Market Plan	M_1	M_2	M_3	M_4	Supply
P_1	4	6	8	13	50
P_2	13	11	10	8	70
P_3	14	4	10	13	30
P_4	9	11	13	8	50
Demand	25	35	105	20	

7. Calculate the coefficient of correlation and obtain lines of regression for the following data.

x	1	2	3	4	5	6	7	8	9
y	9	8	10	12	11	13	14	16	15

PART - C

(Descriptive/Analytical/Problem Solving/Design questions)

Attempt any Three questions.

(3×10=30)

- If θ be the acute angle between the two line of regression of variables x and y , show that $\tan \theta = \frac{1-r^2}{r} \frac{\sigma_x \sigma_y}{\sigma_x^2 + \sigma_y^2}$ where r, σ_x, σ_y have their usual meaning. Explain the significance where $r = 0$ and $r = \pm 1$
- A random variable x has the following probability distribution:

x	0	1	2	3	4	5	6	7
$P(x)$	0	k	$2k$	$2k$	$3k$	k^2	$2k^2$	$7k^2 + k$

i) Find K .

ii) Evaluate $P(x < 6)$, $P(x \geq 6)$ and $P(0 < x < 5)$

iii) Find distribution function of x .

iv) Find $P\left(\frac{1.5 < x < 4.5}{x > 2}\right)$

3. Solve the following problem.

$$\begin{aligned}\text{Minimize } f(x) &= x_1^2 + x_2^2 + x_3^2 \\ \text{Subject to } g_1(x) &= 2x_1 + x_2 - 5 \leq 0 \\ g_2(x) &= x_2 + x_1 - 2 \leq 0 \\ g_3(x) &= 1 - x_1 \leq 0 \\ g_4(x) &= 2 - x_2 \leq 0 \\ g_5(x) &= -x_3 \leq 0\end{aligned}$$

4. What are the engineering Application of optimization also give various classification of optimization problems.

5. Use Two phase simplex method to solve the following LPP

$$\text{Max } z = 5x_1 + 8x_2$$

$$\text{S.t } 3x_1 + 2x_2 \geq 3$$

$$x_1 + 4x_2 \geq 4$$

$$x_1 + x_2 \leq 5$$

$$x_1, x_2 \geq 0$$

ersahilkagyan.com