K24P 3134

Reg. No. : ....

Name : ....

III Semester M.Sc. Degree (C.B.C.S.S. – OBE – Regular) Examination, October 2024
(2023 Admission)
MATHEMATICS/MATHEMATICS (MULTIVARIATE CALCULUS AND MATHEMATICAL ANALYSIS, MODELLING AND SIMULATION, FINANCIAL RISK MANAGEMENT)
Open Elective Course
MSMAT03O03/MSMAF03O03 – Operations Research

Time : 3 Hours

Max. Marks : 80

PART – A

Answer **any five** questions. **Each** question carries **4** marks :

1. Define and explain the general Linear Programming Problem.
2. Explain degeneracy in L.P. Problems.
3. Write the dual of the following LPP :

   Minimize $x_1 - 3x_2 - 2x_3$ subject to $2x_1 - 4x_2 \geq 12$, $3x_1 - x_2 + 2x_3 \leq 7$, $-4x_1 + 3x_2 + 8x_3 = 10$, x_1, $x_2 \geq 0$ and x_3 unrestricted.
4. Explain the occurrence of loops in transportation array.
5. Write a short note on Integer Programming Problem (IPP). Illustrate with an example.
6. Explain various types of games.

(5×4=20)

PART – B

Answer **any three** questions. **Each** question carries **7** marks :

7. Prove : The set S_p of feasible solutions if not empty is a convex set bounded from below and has at least one vertex.
8. Define the dual of the L.P. problem. Prove that the dual of a dual is the primal in L.P. problem.

9. Use simplex method to solve the following LPP :

Maximize $Z = 5x_1 + 3x_2$

Subject to

$x_1 + x_2 \leq 12,$

$5x_1 + 2x_2 \leq 10,$

$3x_1 + 8x_2 \leq 12,$

$x_1, x_2 \geq 0.$

10. Solve the following Transportation problem :

	M1	M2	M3	M4	Capacity
F1	11	20	7	8	50
F2	21	16	10	12	40
F3	8	12	18	9	70
Requirement	30	25	35	40	–

11. Solve the following minimal assignment problem :

	I	II	III	IV	V	VI
A	9	22	58	11	19	27
B	43	78	72	50	63	48
C	41	28	91	37	45	33
D	74	42	27	49	39	32
E	36	11	57	22	25	18
F	3	56	53	31	17	28

(3×7=21)

PART – C

Answer **any three** questions. **Each** question carries **13** marks :

12. Solve the following LPP by dual simplex method :

Minimize $x_1 + 3x_2$ Subject to, $2x_1 + 3x_2 \leq 30$, $x_1 + 2x_2 \geq 10$, $x_1, x_2 \geq 0$.

13. Solve the following LPP by Cutting plane method :

Minimize $4x_1 + 5x_2$ subject to,

$3x_1 + x_2 \geq 2$, $x_1 + 4x_2 \geq 5$, $3x_1 + 2x_2 \geq 7$, $x_1, x_2 \geq 0$.

14. a) Let f(X, Y) be such that both $\underline{\max}\ \underline{\min}\ f(X, Y)$ and $\underline{\min}\ \underline{\max}\ f(X, Y)$ exists. Then state and prove the necessary and sufficient condition for the existence of a saddle point (X_0, Y_0) of f(X, Y).

b) Examine for saddle point and hence obtain the optimal strategies and the value of the following game :

Firm A/Firm B	**B1**	**B2**	**B3**	**B4**	**B5**
A1	3	–1	4	6	7
A2	–1	8	2	4	12
A3	16	8	6	14	12
A4	1	11	–4	2	1

15. Explain the Dominance property. The following table represents the pay off matrix with respect to Player A. Solve the game optimally using dominance property.

A/B	**B1**	**B2**	**B3**	**B4**	**B5**
A1	4	6	5	10	6
A2	7	8	5	9	10
A3	8	9	11	10	9
A4	6	4	10	6	4

16. a) Define mathematical expectations on the pay off function E(X, Y) in the game where Pay off matrix $A = (a_{ij})$.

b) Consider the payoff matrix of the Player A as shown below, solve it optimally using graphical method.

Player A/Player B	**B1**	**B2**	**B3**	**B4**	**B5**
A1	–4	2	5	–6	6
A2	3	–9	7	4	8

(3×13=39)

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