

2019**MCA****4th Semester Examination****OR and OPTIMIZATION TECH.****PAPER – MCA-405****Full Marks : 100****Time : 3 Hours**

The figures in the right-hand margin indicate full marks.

Candidates are required to give their answers in their own words as far as practicable.

Illustrate the answers wherever necessary.

Answer any **FIVE** questions :

14x5=70

- 1.a) A company manufactures two types of computer , type A and type B . Manufacturing A type A computer requires 4 hours of labour and 2 computer chips . Each type B computer Requires 2 hours of labour and 1 computer chip . There are 800 hours of labour and 700 Chips available per month. The company is able to sell up to 100 type A computers and Up to 400 type B computers per month . For each type A computer sold the company makes a profit of Rs. 1500, while the profit on each type B computer is Rs. 500 . The Company's aim is to maximize monthly profits . Formulate this problem as a Linear Program. Sketch the feasible region of the problem, and find the optimal solution .Which,if any, of the constraints are redundant and which are binding at optimality ?

- b) Define : Slack Variable, Surplus Variable, Basic Variables, Non- Basic Variables, Infeasible

Solution, Feasible Region.

7+7

(Turn Over)

2. Consider the following problem and solve using the simplex method :

$$\text{Max } Z = -5x_1 + 5x_2 + 12x_3$$

$$\text{Such that } -x_1 + x_2 + 3x_3 \leq 20$$

$$12x_1 + 4x_2 + 10x_3 \leq 90$$

$$x_1, x_2, x_3 \geq 0$$

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3. a) Use graphical method solve :

7+7

$$\text{Max } Z = 2x_1 + 3x_2$$

$$\text{Such that } x_1 - x_2 \leq 2$$

$$x_1 + x_2 \geq 4$$

$$x_1, x_2 \geq 0$$

b) Solve the following LP problem by Algebraic Simplex Method

$$\text{Maximize } Z = 20x_1 + 10x_2$$

$$\text{Subject to : } x_1 - x_2 \leq 1$$

$$3x_1 + x_2 \leq 7$$

$$x_1, x_2 \geq 0$$

4. a) Apply the principle of duality to solve the LPP

7+7

$$\text{Max } Z = 3x_1 + 2x_2$$

$$\text{Such that } x_1 + x_2 \geq 1$$

$$x_1 + x_2 \leq 7$$

$$x_1 + 2x_2 \leq 10$$

$$x_2 \leq 3$$

$$x_1, x_2 \geq 0$$

b) Solve the following Linear Programming Problem :

$$\text{Max } Z = 3x_1 - x_2$$

$$\text{Sub to } 2x_1 + x_2 \geq 2$$

$$x_1 + 3x_2 \leq 2$$

$$x_1 \leq 4$$

5. a) A dairy firm has three plants located in a state and the firm must fulfil the needs of its four distribution centres. The daily milk production at each plant and the minimum requirement of each centre is given in the following table :

		Distribution Centre				Supply
		D1	D2	D3	D4	
Plant	P1	2	3	11	7	6
	P2	1	0	6	1	1
	P3	5	8	15	9	10
Demand		7	5	3	2	

Find the initial basic feasible solution for given problem by using following methods .

i) North – West corner method .

ii) Vogel's approximation method .

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b) A department of a company has five employees with five jobs to be performed .

The time (in hours) that each man takes to perform each job is given in the

Following matrix :

		Employees				
		I	II	III	IV	V
Jobs	A	10	5	13	15	16
	B	3	9	18	13	6
	C	10	7	2	2	2
	D	7	11	9	7	12
	E	7	9	10	4	12

How should the job be allocated , one per employees so as to minimize the total man – hours ? 6

6. a) ABC company has 5 tasks and 5 persons to perform Determine the optimal assignment

That minimize the total cost .

Jobs	Machines				
	A	B	C	D	E
P	6	7	5	9	4
Q	7	5	10	9	6
R	5	4	3	6	5
S	8	3	5	6	4
T	4	7	5	6	6

b) "Operation Research is an aid for the executive in making his / her decisions by providing him / her with needed quantitative information based on the scientific method of analysis" ;

Discuss the statement and give examples to demonstrate how Operation Research is

Helpful in decision making .

7+7=14

7. a) Solve the following LPP problem using Big – M method :

$$\text{Max } Z = x_1 - x_2 + 3x_3$$

$$\text{S.t. } x_1 + x_2 \leq 20$$

$$x_1 + x_3 = 5$$

$$x_2 + x_3 \geq 10$$

$$x_1, x_2, x_3 \geq 0$$

b) Write short notes as : (any two)

i) Degeneracy in LP problem

ii) Unboundedness

iii) Alternate Optima

7+7=14

[Internal Assessment – 30]