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07MCA25

Second Semester MCA Degree Examination, June/July 2011
Operations Research

Time: 3 hrs. Max. Marks:100

Note: ***Answer any FIVE full questions.***

1 a. Explain the nature and impact of OR, with one example. **(06 Marks)**

b. Formulate a mathematical model and testing the model for LPP. **(06 Marks)**

c. Solve the LPP by graphical method

Maximize $Z = 3x_1 + 2x_2$

Subject to the constraints : $2x_1 + x_2 \leq 1$

$x_1 \leq 2$

$x_1 + x_2 \leq 3$

$x_1, x_2 \geq 0.$ **(08 Marks)**

2 a. Solve the following LPP :

i) By Big – M method

Maximize $Z = 3x_1 + 2x_2$

Subject to constraints : $2x_1 + x_2 \leq 2$

$3x_1 + 4x_2 \geq 12$

$x_1, x_2 \geq 0.$

ii)By two – phase method

Maximize $Z = 5x_1 - 4x_2 + 3x_3$

Subject to constraints $2x_1 + x_2 - 6x_3 = 20$

$6x_1 + 5x_2 + 10x_3 \leq 76$

$8x_1 - 3x_2 + 6x_3 \leq 50$

$x_1, x_2, x_3 \geq 0.$ **(10 Marks)**

b. Explain the post optimality analysis for LPP, with examples. **(10 Marks)**

3 a. Define the following terms, with one example each :

i) Objective function

ii) Constraints

iii) Feasible solution

iv) Optimum solution. **(08 Marks)**

b. Solve the following LPP by revised simplex method

Maximize $Z = 3x_1 + 2x_2 + 5x_3$

Subject to the constraints $x_1 + 2x_2 + x_3 \leq 430$

$3x_1 + 2x_3 \leq 460$

$x_1 + 4x_2 \leq 420$

$x_1, x_2, x_3 \geq 0.$ **(12 Marks)**

4 a. Explain the economic interpretation of duality. **(04 Marks)**

b. Describe the role of duality theory in sensitivity analysis. **(08 Marks)**

c. Solve the LPP by applying sensitivity analysis, theoritically. **(08 Marks)**

5 a. Describe the streamlined simplex method for the transportation problem. **(04 Marks)**

b. Solve the following transportation problem using North –West corner rule.

	D	E	F	G	Available
A	11	13	17	14	250
B	16	18	14	10	300
C	21	24	13	10	400
Requirement	200	225	275	250.	

(08 Marks)

c. Solve the following transportation problem using Vogel's approximation method.

	D	E	F	G	Available
A	11	13	17	14	250
B	16	18	14	10	300
C	21	24	13	10	400
Demand	200	225	275	250.	

(08 Marks)

6 a. Explain a special algorithm for the Hungarian assignment problem. **(04 Marks)**

b. Write short notes on :

i) Nature of metaheuristics

ii) Tabu search

iii) Simulated annealing

iv) Genetic algorithms. **(16 Marks)**

7 a. Explain the formulation of two person, zero – sum games. **(08 Marks)**

b. Explain the graphical procedure for solving games. **(08 Marks)**

c. Solve a game with mixed strategies using LPP.

	P_2	
P_1	5	1
	3	4

(04 Marks)

8 Write short notes on :

a. Applications of OR

b. Least – cost method

c. Non – traditional transportation models

d. Assumptions of linear programming. **(20 Marks)**

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10MCA25

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Note: ***Answer any FIVE full questions.***

1 a. Define Operating Research. Explain the different phases in the study of operation research. **(14 Marks)**

b. Write any three assumptions of linear programming and explain. **(06 Marks)**

2 a. Define i) Linear programming ii) Optimal solution iii) Feasible region with suitable examples. **(06 Marks)**

b. Which type of linear programming problem is solved using graphical method? **(02 Marks)**

c. Two products A and B are produced in a company. Both products are manufactured in a common production process. Each unit of product A requires 0.6 hours while each unit of product B requires 1.2 hours and a total production capacity of 480 hrs is available per week. The raw material required for the products is in short supply and the maximum productions possible per week for A and B on account of scarcity of material are 400 and 300 units respectively. Profit per unit for A and B are Rs 20 and Rs 30 respectively.

i) Find the optimal product mix.

ii) "If the actual profit per unit for product B is Rs 40 instead of Rs 30, the optimal policy will change". What is the revised product mix and how much should the company lost has it stuck to the old product mix?

iii) "Steep rise in the cost of raw materials has reduced the profit of product A to Rs 10 per unit". How will the revised figures (Rs 10 and Rs 40) affect the product mix? **(12 Marks)**

3 a. Use simplex method to solve the following LPP :

Maximize $Z = 4000x_1 + 2000x_2 + 5000x_3$

Subject to $12x_1 + 7x_2 + 9x_3 \leq 1260$

$22x_1 + 18x_2 + 16x_3 \leq 19008$

$2x_1 + 4x_2 + 3x_3 \leq 396$ and $x_1, x_2, x_3 \geq 0$. **(10 Marks)**

b. Explain i) Tie for the entering basic variable ii) Tie for the leaving basic variable iii) No leaving basic variable iv) Multiple optimal solutions. Also write the steps used in resolving the same. **(10 Marks)**

4 a. Use Two – Phase simplex method to solve the following LPP :

Maximize $Z = 5x_1 - 2x_2 + 3x_3$

Subject to $2x_1 + 2x_2 - x_3 \geq 2$

$3x_1 - 4x_2 \leq 3$

$x_2 + 3x_3 \leq 5$ and $x_1, x_2, x_3 \geq 0$. **(08 Marks)**

b. Use revised simplex method to solve the following LPP :

Maximize $Z = 2x_1 + x_2$

Subject to the constraints $3x_1 + 4x_2 \leq 6$

$6x_1 + x_2 \leq 3$ and $x_1, x_2 \geq 0$. **(12 Marks)**

5 a. A company makes three products X, Y, Z out of three raw materials A, B and C. The number of units of raw materials required to produce one units of raw materials required to product one unit of product is as given in the following table :

	X	Y	Z
A	1	2	1
B	2	1	4
C	2	5	1

The unit profit contribution of the products X, Y and Z are Rs 40, 25 and 50 respectively. The number of units of raw materials available are 36, 60 and 45 respectively.

i) Determine the product mix that will maximize the total profit.

ii) Through the final simplex table, write the solution to the dual problem. **(10 Marks)**

b. Use the dual simplex method to solve the following problem :

Maximize $Z = -2x_1 - x_2$

Subject to $3x_1 + x_2 = 3$

$4x_1 + 3x_2 \geq 6$

$x_1 + 2x_2 \leq 3$ and $x_1, x_2 \geq 0$. **(10 Marks)**

6 a. Five lectures by experts are to be scheduled so as not to conflict with one another. The lecturers are to be delivered in the afternoon on week days only, otherwise, because of other close schedules, certain students will be forced to drop out these lectures. The following table or matrix indicates the number of absentees lecturewise and daywise. Schedule these lectures in such a way as to minimize the total number of students forced to remain absent. **(10 Marks)**

Lecture / Day	1	2	3	4	5
Monday	3	2	3	9	10
Tuesday	11	5	9	10	2
Wednesday	1	3	8	2	4
Thursday	8	11	10	5	2
Friday	8	6	5	6	9

b. A company has three plants at locations A, B and C which supply to warehouses located at D, E, F, G and H. Monthly plant capacities are 800, 500 and 900 units respectively. Monthly ware house requirements are 400, 400, 500, 400 and 800 units respectively. Unit transportation costs (in Rs) are given below :

	To D	E	F	G	H
A	5	8	6	6	3
From B	4	7	7	6	5
C	8	4	6	6	4

Determine an optimum distribution for the company in order to minimize the total transportation cost. Find the initial BFs using VAM. **(10 Marks)**

7 a. What are : i) Heuristic method ii) Meta – heuristic. **(05 Marks)**

b. Write the outline of a basic Tabu search algorithm. **(05 Marks)**

c. A salesman has to visit 5 cities A, B, C, D and E. The distances (in hundred miles) between the five cities are as follows :

From \ To	A	B	C	D	E
A	-	7	6	8	4
B	7	-	8	5	6
C	6	8	-	9	7
D	8	5	9	-	8
E	4	6	7	8	-

If the salesman starts from city A and has to come back to city A, which route should he select so that total distance traveled is minimum? **(10 Marks)**

8 a. Define
i) Saddle point ii) Pay – off iii) Maxi – Min principle and iv) Mini – Max principle. **(04 Marks)**

b. Consider (two – person, zero sum) game matrix which represent payoff to the player A. Find the optimal strategy, if any. **(04 Marks)**

		B		
		I	II	III
A	I	-3	-2	6
	II	2	0	2
	III	5	-2	-4

c. Solve (3 × 3) game by the simplex method of linear programming whose payoff matrix is given below : **(12 Marks)**

		Player B		
		1	2	3
PlayerA	1	3	-1	-3
	2	-3	3	-1
	3	-4	-3	3

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