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06CS/IS661

Sixth Semester B.E. Degree Examination, June/July 2014
Operations Research

Time: 3 hrs. Max. Marks:100

Note: ***Answer FIVE full questions, selecting at least TWO questions from each part.***

PART – A

1 a. What is Operations Research? Mention six phases of an operations research study. **(05 Marks)**

b. A farmer has 1,000 acres of land on which he can grow corn, wheat or soyabeans. Each acre of corn costs ₹100 for preparation, requires 7-mandays of work and yields a profit of ₹30. An acre of wheat costs ₹120 to prepare, requires 10-mandays of work and yields a profit of ₹40. An acre of soyabeans costs ₹70 to prepare, requires 8-mandays of work and yields a profit of ₹20. If the farmer has ₹1,00,000 for preparation and can count on 8,000 mandays work, formulate the L.P. model to allocate the number of acres to each crop to maximize the total profit. **(08 Marks)**

c. Using Graphical method solve the LPP :

Maximize $Z = 5x_1 + 4x_2$

Subject to $6x_1 + 4x_2 \le 24$

$x_1 + 2x_2 \le 6$

$-x_1 + x_2 \le 1$

$x_2 \le 2$; $x_1, x_2 \ge 0$ **(07 Marks)**

2 a. Define the following terms:

(i) Slack variable (ii) Surplus variable (iii) Artificial variable. **(06 Marks)**

b. Write six key solution concepts of simplex method. **(06 Marks)**

c. Solve the problem using simplex method.

Maximize $Z = 4x_1 + 3x_2 + 6x_3$

Subject to $2x_1 + 3x_2 + 2x_3 \le 440$

$4x_1 + 3x_3 \le 470$

$2x_1 + 5x_2 \le 430$; $x_1, x_2, x_3 \ge 0$ **(08 Marks)**

3 a. Use Big-M method and solve the problem:

Maximize $Z = 3x_1 - x_2$

Subject to $2x_1 + x_2 \le 2$

$x_1 + 3x_2 \ge 3$

$x_2 \le 4$; $x_1, x_2 \ge 0$ **(10 Marks)**

b. Use the two-phase simplex method to

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

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

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

$8x_1 - 3x_2 + 6x_3 \le 50$; $x_1, x_2, x_3 \ge 0$ **(10 Marks)**

4 a. Use revised simplex method to solve the LPP.

Maximize $Z = 2x_1 + x_2$

Subject to $3x_1 + 4x_2 \le 6$

$6x_1 + x_2 \le 3$; $x_1, x_2 \ge 0$ **(12 Marks)**

b. Explain the key relationships between primal and dual problem. **(08 Marks)**

PART – B

5 a. Explain the of duality theory in sensitivity analysis. **(06 Marks)**

b. In brief, explain the dual simplex method. **(06 Marks)**

c. Illustrate the upper bound technique:

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

Subject to $4x_1 + x_2 = 12$

$-2x_1 + x_3 = 4$

and $0 \le x_1 \le 4, \quad 0 \le x_2 \le 15, \quad 0 \le x_3 \le 6$ **(08 Marks)**

6 a. Given below is the time required (in days) when a particular software program module is assigned to a particular programmer.

		Programmers			
		A	B	C	D
Modules	1	12	10	8	9
	2	8	9	11	7
	3	11	14	12	10
	3	9	9	8	9

Assign the modules to different programmers in such a way that the total computing time is least. **(10 Marks)**

b. Solve the following travelling salesman job.

		To city				
		1	2	3	4	5
From city	1	-	10	25	25	10
	2	1	-	10	15	2
	3	8	9	-	20	10
	4	14	10	24	-	15
	5	10	8	25	27	-

(10 Marks)

7 a. Solve the following game with the payoff matrix **(08 Marks)**

		Player B			
		B_1	B_2	B_3	B_4
Player A	A_1	1	7	3	4
	A_2	5	6	4	5
	A_3	7	2	0	3

b. Solve the following 2×3 game graphically **(12 Marks)**

		Player B		
		B_1	B_2	B_3
Player A	A_1	1	3	12
	A_2	8	5	2

8 Explain briefly:

a. Metaheuristics, its nature, advantage and disadvantage.

b. Minimum spanning tree problem with constraints

c. Tabu search algorithm

d. Genetic algorithm. **(20 Marks)**

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