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10CS/IS661

Sixth Semester B.E. Degree Examination, Jan./Feb. 2021
Operations Research

Time: 3 hrs. Max. Marks:100

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

PART – A

1 a. Define Operations Research. Briefly explain the phases of Operations Research. **(08 Marks)**

b. Solve the following LPP by graphical method:

Minimize $Z = 20x_1 + 10x_2$

Subject to $x_1 + 2x_2 \leq 40$

$3x_1 + x_2 \geq 30$

$4x_1 + 3x_2 \geq 60$ and

$x_1 \geq 0, x_2 \geq 0$ **(06 Marks)**

c. The following table gives data for a Linear Programming Problem where the objective is to maximize the profit from allocating 3 resources to 2 non negative activities. Formulate the LPP model for this problem. **(06 Marks)**

Resource	Resource Requirement/unit		Availability
	Activity 1	Activity 2	
1	2	1	10
2	3	3	20
3	2	4	20
Profit/unit	20	30	

2 a. Explain the special cases that arise in the use of simplex method. **(10 Marks)**

b. Solve the following LPP using simplex method in tabular form.

Maximize $Z = x + 1.5y$

Subject to $x + 2y \leq 160$

$3x + 2y \leq 240$ and

$x \geq 0, y \geq 0$ **(10 Marks)**

3 a. Explain two phase technique to solve LPP in simplex method. **(06 Marks)**

b. Use Big-M method to solve the following LPP

Maximize $Z = 2x_1 + x_2$

Subject to $3x_1 + x_2 = 3$

$4x_1 + 3x_2 \geq 6$

$x_1 + 2x_2 \leq 3$ **(14 Marks)**

4 a. Explain the computational procedure of revised simplex method in standard form. (10 Marks)
b. Explain the relation between the solution of the primal and the dual. (06 Marks)
c. Find the dual of the following problems:
i) Maximize $Z = x_1 + 2x_2 + x_3$
Subject to $2x_1 + x_2 - x_3 \leq 2$
$-2x_1 + x_2 - 5x_3 \geq -6$
$4x_1 + x_2 + x_3 \leq 6$
$x_1, x_2, x_3 \geq 0$

ii) Maximize $Z = 6x_1 + 10x_2$
Subject to $x_1 \leq 14$
$x_2 \leq 16$
$3x_1 + 2x_2 \leq 18$
$x_1, x_2 \geq 0$
(04 Marks)

PART – B

5 a. Write the procedure for sensitivity analysis. (08 Marks)
b. Use dual simplex method to solve the following:
Maximize $Z = -2x_1 - 3x_2$
Subject to $x_1 + x_2 \geq 2$
$2x_1 + x_2 \leq 10$
$x_1 + x_2 \leq 8$
$x_1 \geq 0 \quad x_2 \geq 0$
(12 Marks)

6 a. Write different steps in Hungarian Algorithm to solve an assignment problem. (08 Marks)
b. Obtain optimal solution of transportation problem using the data given below. Use Vogel's approximation method to obtain an initial basic feasible solution. (12 Marks)

	D_1	D_2	D_3	D_4	Supply
S_1	19	30	50	10	7
S_2	70	30	40	60	9
S_3	40	8	70	20	18
Demand	5	8	7	14	34

7 a. Solve the game whose pay off matrix is given below:

Player B

Player A

3	2	4	0
3	4	2	4
4	2	4	0
0	4	0	8

(10 Marks)

b. Use graphical method to solve the following game:

Player B

Player A

A	B_1	B_2	B_3	B_4
A_1	2	2	3	-2
A_2	4	3	2	6

(10 Marks)

8 a. Explain genetic algorithm and simulate annealing algorithm. (12 Marks)
b. Explain in detail the minimum spanning free with constraints. (08 Marks)

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