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10CS/IS661

Sixth Semester B.E. Degree Examination, Aug./Sept.2020
Operations Research

Time: 3 hrs. Max. Marks:100

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

PART - A

1 a. Explain six phases of Operation Research Study. **(06 Marks)**

b. The Sigmaware manufacture company has discontinued the production of a certain unprofitable product which has created considerable excess production capacity. Management is considered devoting this excess capacity to one or more of 3 products. The available capacity on the machine is given below :

Machine Type	Milling machine	Lathe machine	Grinder
Available Time	400 hrs	300 hrs	150 hrs

The number of machine hours required for each unit of the respective product.

Machine Type	Product 1	Product 2	Product 3
Milling machine	9	4	6
Lathe	5	3	0
Grinder	4	0	1

The sales department indicates the sales potential for product 3 exceeds 20units/week. The unit profit will be \$15, \$20, \$25 respectively. The objective is to determine how much of each product the company should produce to maximize the profit. Formulate the LPP. **(07 Marks)**

c. Use Graphical method to solve the problem
Maximize $Z = 2x_1 + x_2$
Subject to $x_2 \le 10$
$2x_1 + 5x_2 \le 60$
$x_1 + x_2 \le 18.$ **(07 Marks)**

2 a. Define Slack variable and Surplus variable. **(04 Marks)**

b. Solve the following LPP by Simplex method.
Maximize $Z = 5x_1 + 4x_2$
Subject to $3x_1 + 5x_2 \le 18$
$5x_1 + 2x_2 \le 12$
where $x_1, x_2 \ge 10.$ **(10 Marks)**

c. Explain the concept of Tie – breaking in Simple method. **(06 Marks)**

3 a. Solve the following LPP by Big – M method.
Maximize $Z = 3x - y$
Subject to $2x + y \ge 2$
$x + 3y \le 3$
$y \le 4$, $x, y \ge 0.$ **(10 Marks)**

b. Solve the following LPP by Two – Phase method
Maximize $Z = 15/2x - 3y$
Subject to $3x - y - z \ge 3$
$x - y + z \ge 2$
where $x, y \ge 0.$ **(10 Marks)**

4 a. Solve the following LPP by revised simplex method
Maximize $Z = 2x_1 + x_2$
Subject to $3x_1 + 4x_2 \leq 6$
$6x_1 + x_2 \leq 3$
where $x_1, x_2 \geq 0$. **(12 Marks)**

b. Explain the following :
i) The essence of Duality theory ii) Primal dual relationship. **(08 Marks)**

PART - B

5 a. Use Dual Simple method to solve LPP.
Minimize $Z = 2x_1 + x_2$
Subject to $3x_1 + x_2 \geq 3$
$4x_1 + 3x_2 \geq 6$
$x_1 + 2x_2 \geq 3$, $x_1, x_2 \geq 0$. **(10 Marks)**

b. Briefly discuss about Sensitivity analysis. **(10 Marks)**

6 a. Explain the various steps involved in Hungarian method with example. **(06 Marks)**

b. Solve the following assignment problem : **(04 Marks)**

12	30	21	15
18	33	9	22
44	25	24	21
23	20	28	14

c. A company is spending Rs 1000 everyday on transportation of its units from three plants to 4 distribution centers. The supply and demand units with unit cost of transportation are given as **(10 Marks)**

	D_1	D_2	D_3	D_4	↓ Capacity
P_1	19	30	50	12	7
P_2	70	30	40	60	10
P_3	40	10	60	20	18
	5	8	7	15	

7 a. Define the following with respect to games :
i) Zero – sum game ii) Pure – strategy iii) Mixed strategy iv) Pay off. **(06 Marks)**

b. Solve the following game by dominance property : **(08 Marks)**

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

c. Solve the following game by Graphical method : **(06 Marks)**

	Player B			
Player A	B_1	B_2	B_3	B_4
A_1	8	5	-7	9
A_2	-6	6	4	-2

8 Explain briefly the following :
a. Tabu Search algorithm.
b. Genetic algorithm.
c. Metaheuristics.
d. Simulated Annealing algorithm. **(20 Marks)**

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