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10CS/IS661

Sixth Semester B.E. Degree Examination, Dec.2023/Jan.2024
Operations Research

Time: 3 hrs. Max. Marks:100

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

PART – A

1 a. Explain the phases of operation search. **(04 Marks)**

b. The postmaster of a local post office wishes to hire extra helpers during new year season to manage large increase in the volume of mail handling and delivery. Due to the limited office space and budget condition, the number of temporary helpers must not exceed 10. According to past experience men can handle 300 letters and 80 packages per day and women can handle 400 letters and 50 packages per day. The post master believes that the daily volume of extra mail and packages will not be more than 3400 and 680 respectively. A man receives Rs. 250/- a day and a woman receives Rs. 220/- a day. How many number of men and women helpers should be hired to keep the payroll at a minimum. **(06 Marks)**

c. A toy company manufactures two types of dolls, a basic version doll 'A' and a deluxe version doll 'B'. Each doll of type B takes twice as long to produce as one of type A and the company would have time to make a maximum 2000 per day. The supply of plastic is sufficient to produce 1500 dolls per day (both A and B combined). The deluxe version requires a fancy dress of which there are only 600 per day available. If the company makes profit of Rs. 3.00 and Rs. 5.00 per dell respectively on doll A and B. How many of each should be produce per day in order to maximize profit. Solve by using graphical method. **(10 Marks)**

2 a. Explain the setting up of simplex method. **(04 Marks)**

b. Using Simplex method , solve the following LPP taking

$x_1 = y_1 + 10$
$x_2 = y_2 + 20$ and
$x_3 = y_3 + 30$, the
LPP becomes.

Maximize $Z = 10y_1 + 15y_2 + 8y_3 + 640$
Subject to $y_1 + 2y_2 + 2y_3 \leq 90$
$2y_1 + y_2 + y_3 \leq 150$
$3y_1 + y_2 + 2y_3 \leq 70$
and $y_1, y_2, y_3 \geq 0$. **(13 Marks)**

c. Why Simplex method is better than graphical method? **(03 Marks)**

3 a. Solve the following LPP by Big M method:
Maximize $Z = 3x_1 - x_2$
Subject to the constraints $2x_1 + x_2 \geq 2$
$x_1 + 3x_2 \leq 3$
$x_2 \leq 4$ and $x_1, x_2 \geq 0$ **(10 Marks)**

b. Solve the following using Two phase method:
Minimize $Z = 0.4x_1 + 0.5x_2$
Subject to $0.3x_1 + 0.1x_2 \leq 2.7$
$0.5x_1 + 0.5x_2 = 6$
$0.6x_1 + 0.4x_2 \geq 6$ and $x_1, x_2 \geq 0$ **(10 Marks)**

4 a. Explain the computational procedure of revised Simplex method in standard form. **(08 Marks)**

b. Using revised Simplex method solve the following LPP :
Minimize $Z = x_1 + x_2$
Subject to $x_1 + 2x_2 \geq 7$
$4x_1 + x_2 \geq 6$
and $x_1, x_2 \geq 0$. **(12 Marks)**

PART – B

5 a. In parametric linear programming explain
i) Systematic changes in the cj parameters
ii) Systematic changes in the bj parameters. **(06 Marks)**

b. Write the dual of the following LP problem and solve it
Maximize $Z = 4x_1 + 2x_2$
Subject to $-x_1 - x_2 \leq -3$
$-x_1 + x_2 \leq -2$ and $x_1, x_2 \geq 0$
Hence or otherwise write down the solution of primal. **(10 Marks)**

c. Write in brief about economic interpretation of duality. **(04 Marks)**

6 a. Find the initial basic feasible solution using North West corner rule and Vogel's approximation method for the following transportation problem :

19	30	50	10	7
70	30	40	60	9
40	8	70	20	18
5	8	7	14	

(10 Marks)

b. Write the procedure of Hungarian method. **(05 Marks)**

c. Find the optimal solution to the following assignment problem showing the costs (Rs) for assigning workers to jobs.

		Job		
Workers	W_1	18	17	16
	W_2	15	13	14
	W_3	19	20	21

(05 Marks)

7 a. Two competitors A and B are competing for the same product. Their different strategies are given in the following pay off matrix :

Company A \ Company B	I	II	III	IV
I	3	2	4	0
II	3	4	2	4
III	4	2	4	0
IV	0	4	0	8

Use dominance principle to find optimal strategies. **(10 Marks)**

b. Solve the following 2×4 game graphically :

A \ B	I	II	III	IV
I	2	2	3	-1
II	4	3	2	6

(10 Marks)

8 Explain briefly :

a. Table search algorithm
b. Genetic algorithm
c. Metaheuristics
d. Simulated annealing algorithm. **(20 Marks)**

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