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10CS/IS661

Sixth Semester B.E. Degree Examination, June/July 2016
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. Define the following with reference to linear programming model.
   i) Unbounded solution
   ii) Feasible solution
   iii) Slack variable
   iv) Surplus variable
   v) Optimal Solution. **(10 Marks)**

b. The whit window company is a company with only 3 employees which makes two different kinds of handcrafted windows a wood framed and an aluminum framed window. They earn \$60 profit for each wood framed window and \$30 profit for each aluminum framed window. Doug makes the wood frames and can make 6 per day. Linda makes the aluminium frames and can make 4 per day. Bob forms and cuts the glass and can make 48 square feet of glass per day. Each wood framed window uses 6 square foot of glass and each aluminum framed windows used 8 square feet of glass. The company wishes to determine how many windows of each type to produce per day to it maximize total profit. Formulate it as LPP and solve graphically. **(10 Marks)**

2 a. Find all the basic solutions to the following systems of equations identifying in each case the basic and non basic variable and finally the optimal solution.

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

Subject to

$2x_1 + x_2 + x_3 \le 20$

$3x_1 + x_2 + 2x_3 \le 30$

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

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

Maximize $Z = x_1 + 2x_2 + 4x_3$

Subject to

$3x_1 + x_2 + 5x_3 \le 10$

$x_1 + 4x_2 + x_3 \le 8$

$2x_1 + 2x_3 \le 7$

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

3 a. Solve the following LPP using two phase method.

Minimize $Z = 2x_1 + 3x_2 + x_3$

Subject to

$x_1 + 4x_2 + 2x_3 \ge 8$

$3x_1 + 2x_2 \ge 6$

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

b. Use Big M method to solve the problem
Minimize $Z = 3x_1 + 2x_2 + 4x_3$
Subject to
$2x_1 + x_2 + 3x_3 = 60$
$3x_1 + 3x_2 + 5x_3 \geq 120$
$x_1, x_2, x_3 \geq 0.$ **(10 Marks)**

4 a. Solve by revised simplex method
Maximize $Z = 6x_1 - 2x_2 + 3x_3$
Subject to
$2x_1 - x_2 + 2x_3 \leq 2$
$x_1 + 4x_3 \leq 4$ and $x_1, x_2, x_3 \geq 0.$ **(10 Marks)**

b. Use duality to solve ;
Minimize $Z_x = 3x_1 + x_2$
Subject to
$x_1 + x_2 \geq 1$
$2x_1 + 3x_2 \geq 2, \ x_1, x_2, x_3 \geq 0.$ **(10 Marks)**

PART – B

5 a. Solve the following problem by dual simplex method.
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. Solve the following problem by using lower bound technique.
Maximize $Z = 10x_1 + 15x_2 + 8x_3$
Subject to
$x_1 + 2x_2 + 2x_3 \leq 200$
$2x_1 + x_2 + x_3 \leq 220$
$3x_1 + x_2 + 2x_3 \leq 180$
$x_1 \geq 10, \ x_2 \geq 20, \ x_3 \geq 30.$ **(10 Marks)**

6 a. Hindustan construction company needs 3, 3, 4 and 5 million cubic feet of fill at four earthen dams-sites in Punjab. It can transfer the fill from three mounds A, B and C where 2, 6 and 7 million cubic feet of fill is available, cost of transporting one million cubic feet of fill from mounds to the four sites in lakhs are given in the table.
Find IBFs by using any method and check for optimality. **(10 Marks)**

		To				
From		I	II	III	IV	ai
	A	15	10	17	18	2
	B	16	13	12	13	6
	C	12	17	20	11	7
	bJ	3	3	4	5	

b. Five men are available to do five different jobs. From past records the time (in hrs) that each man takes to do each job is known and given in the following table ;

		Job				
		I	II	III	IV	V
Man	A	2	9	2	7	1
	B	6	8	7	6	1
	C	4	6	5	3	1
	D	4	2	7	3	1
	E	5	3	9	5	1

Find the assignment of men to jobs that will minimize the total time taken. **(10 Marks)**

7 a. Define the following with reference to game theory with an example :
   i) Pure strategy
   ii) Mixed strategy
   iii) Saddle point
   iv) Pay off matrix
   v) 2 person zero sum games. **(10 Marks)**

b. In a game of matching coins with two players, suppose one player wins Rs 2 when there are two heads and wins nothing when there are two tails and loses Rs 1 when there are one head and one tail. Determine the payoff matrix, the best strategies for each player and the value of the game. **(10 Marks)**

8 Explain briefly the following
a. Tabu search
b. Genetic Algorithm
c. Simulated annealing technique
d. Meta heuristics. **(20 Marks)**

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