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10CS/IS661

Sixth Semester B.E. Degree Examination, Dec.2015/Jan.2016
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. Define Operation Research. List and briefly explain the phases of Operations Research. **(08 Marks)**

b. Solve the following LPP by graphical method.

Min $Z = 20x_1 + 10x_2$

Constraints $x_1 + 2x_2 \leq 40$

$3x_1 + x_2 \geq 30$

$4x_1 + 3x_2 \geq 60$

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

c. A farmer has 100 acres of form. He can sell all tomatoes, lettuce or radishes and can raise the price to obtain Re 1.00 per kg for tomatoes, Rs 0.75 ahead for lettuce and Rs 2.00 per kg for radishes. The average yield per acre is 2000kg of tomatoes, 3000 heads of lettuce, and 1000 kgs of radishes. Fertilizers are available at Rs 0.50 per kg and the amount required per acre is 100 kgs each for tomatoes and lettuce and 50 kgs for radishes. Labour required for sowing, cultivating and harvesting per acre is 5 man – days for tomatoes and radishes and 6 man – days for lettuce. A total of 400 man – days of labour are available at Rs 20.00 per man – day. Formulate this problem as a linear programming model to maximize the farmer's total profit. **(06 Marks)**

2 a. Explain 6 basic assumptions of Simplex method. **(06 Marks)**

b. Solve the following LPP using Simplex method. **(10 Marks)**

Max $Z = 3x_1 + 2x_2 + 5x_3$

Constraints $x_1 + 2x_2 + x_3 \leq 430$

$3x_1 + 2x_3 \leq 460$

$x_1 + 4x_2 \leq 420$

$x_1, x_2, x_3 \geq 0.$

c. Write a brief note on 'Unbounded solution' and 'Infeasible solution' of Simplex method. **(04 Marks)**

3 a. Solve using 'Big – M' method.

Min $Z = 12x_1 + 20x_2$

Constraints $6x_1 + 8x_2 + \geq 100$

$7x_1 + 12x_2 \geq 120$

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

b. Solve using '2 – Phase' method.

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

Constraints $2x_1 + x_2 - 6x_3 = 20$

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

$8x_1 - 3x_2 + 6x_3 \leq 50$

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

4 a. List any 5 differences between Simplex (Primal) and Dual Simplex method. **(05 Marks)**

b. Give the dual of the following problem

Max $Z = x + 2y$

Constraints $2x + 3y \geq 4$

$3x + 4y = 5$; $x \geq 0$, y is unrestricted. **(05 Marks)**

c. Use 'Revised Simplex method' to solve the following LPP.

Max $Z = x_1 + 2x_2$

Constraints $x_1 + x_2 \leq 3$

$x_1 + 2x_2 \leq 5$

$3x_1 + x_2 \leq 6$; $x_1, x_2 \geq 0$. **(10 Marks)**

PART - B

5 a. Use 'Dual Simplex method' to solve the following LPP

Min $Z = 5x_1 + 6x_2$

Constraints $x_1 + x_2 \geq 2$

$4x_1 + x_2 \geq 4$

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

b. Solve the following LPP using 'Branch and Bound' technique.

Max $Z = 7x_1 + 9x_2$

Constraints $-x_1 + 3x_2 \leq 6$

$7x_1 + x_2 \leq 35$

$x_2 \leq 7$

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

6 a. Find an optimal solution after obtaining the IBFS using 'Vogels Approximation method'. **(10 Marks)**

	W_1	W_2	W_3	W_4	Capacity
F_1	19	30	50	10	07
F_2	70	30	40	60	09
F_3	40	08	70	20	18
Demand	05	08	07	14	34

b. Solve the given Assignment problem, so that the total cost is minimized. **(10 Marks)**

	M_1	M_2	M_3	M_4
J_1	05	07	11	06
J_2	08	05	09	06
J_3	04	07	10	07
J_4	10	04	08	03

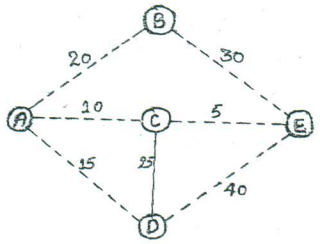
7 a. Use graphical method to solve the following game **(10 Marks)**

$$\begin{matrix} & B \\ A & \begin{bmatrix} 1 & 3 & 11 \\ 8 & 5 & 2 \end{bmatrix} \end{matrix}$$

b. A firm owner is seriously considering of drilling a farm well in the past, only 70% of wells drilled were successful at 200 Feet of depth. Moreover on finding no water at 200 Ft., some persons drilled it further upto 250 Ft but only 20% struck water at 250 Ft. The prevailing cost of drilling is Rs 50/Foot. The farm owner estimated that in case he does not get his own wells he will have to pay Rs 15,000 over the next 10 years in PV term, to buy water from the neighbor. The following decisions can be optimal : i) Do not drill any well ii) Drill upto 200 Ft and iii) If no water is found at 200 Ft, drill further upto 250 Ft.

Draw an appropriate decision tree and determine the farm owner's strategy under Expected Monetary Value (EMV) approach. **(10 Marks)**

8 a. Use Tabu search algorithm to find an optimal solution of the following illustration.
Constraint 1 : Link AD can be included only if link DE also included.
Constraint 2 : At most one of the three links AD, CD and AB can be included. Charge a penalty of Rs 100 if Constraint 1 is violated. Charge a penalty of Rs 100 if two of the three links specified in constraints 2 are included. Increase this penalty to Rs 200 if all the three of links are included. **(10 Marks)**



b. Write a brief note on :
i) Simuted Annealing ii) Genetic Algorithm. **(10 Marks)**

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