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P.E.S. College of Engineering, Mandya - 571 401

(An Autonomous Institution affiliated to VTU, Belgaum)

Second Semester - Master of Computer Applications (MCA)

Semester End Examination; June/July - 2015

Operations Research

Time: 3 hrs *Max. Marks: 100*

***Note: Answer** any **FIVE** Full questions, selecting **ONE** full question from each **unit**.*

UNIT - I

1. a. Define Operations Research and explain the phases of Operations Research. 10

   b. A farmer has to plant two kinds of trees A and B in a land of 4,400 m^2 in area. Tree A required at least 25 m^2 and B requires 40m^2 land. The annual water of A is 30 units and B is 15 units per tree while 3300 units of water is available. If the profit returns of tree A is expected to be 1½ times as much as B. Formulate the problem. 10

2 a. Solve the following LPP using graphical method.

Maximize

$$z_{max} = 2x_1 + x_2$$

Subject to $x_1 - x_2 \le 2$

$x_1 - 2x_2 \le 1$

$x_2 \le 1, x_1 \le 6$

where $x_1 x_2 \ge 0$ 10

b. Determine graphically a solution to the following L.P.P. Identify the feasible region.

Minimize

$$z_{min} = 5x_1 + 8x_2$$

Subject to $x_1 \le 4, x_2 \ge 2$

$x_1 + x_2 = 5$

where $x_1 x_2 \ge 0$ 10

UNIT – II

3 a. Explain: i) Feasible region ii) Slack variable iii) Surplus variable. 6

b. Solve the following L.P.P. using Big – M method,

Minimize

$$z_{min} = 4x_1 + x_2$$

Subject to $3x_1 + x_2 = 3, 4x_1 + 3x_2 \ge 6,$

$x_1 + 2x_2 \le 3$ and $x_1, x_2 \ge 0$ 14

4 a. Solve the following LPP using simplex method. 10

Maximize

Contd…2

$z_{\max} = x_1 + x_2$

Subject to $x_1 + 5x_2 \le 5,\ 2x_1 + x_2 \le 4$

where $x_1, x_2 \ge 0$

b. Solve the following LPP using Two – Phase method.

Maximize

$z_{\max} = 4x_1 + 5x_2 + 2x_3$

Subject to $2x_1 + x_2 + x_3 \le 10,\ x_1 + 3x_2 + x_3 \le 12$

$x_1 + x_2 + x_3 \le 6$

where $x_1, x_2, x_3 \ge 0$ 10

UNIT - III

5 a. Solve the following LPP using Dual simplex method.

Maximize

$z_{\max} = -3x_1 - 2x_2$

Subject to $x_1 + x_2 \ge 1,\ x_1 + x_2 \le 7$

$x_1 + 2x_2 \ge 10,\ x_1 \le 3$

where $x_1, x_2 \ge 0$ 10

b. Write the steps involved in Revised simplex method. 10

6. a. Write the Dual of the given LPP.

Maximize

$z_{Max} = 4x_1 + 5x_2 + 12x_3$

Subject to $2x_1 + x_2 + x_3 \le 4,\ 3x_1 - 2x_2 + x_3 \le 3$

$4x_1 + 3x_2 \le 10$ where $x_1, x_2, x_3 \ge 0$ 6

b. Write the relationship between the primal and Dual LPP. 6

c. What is Sensitivity analysis and state its advantages. 8

UNIT - IV

7 a. What is degeneracy in Transportation problem and explain how to resolve it with example. 5

b. Consider the following transportation table having unit transportation cost from factor y to destination. 15

		Destination				
		D_1	D_2	D_3	D_4	Supply units
Factory	F_1	6	1	9	3	70
	F_2	11	5	2	8	55
	F_3	10	12	4	7	90
	Required Units	85	35	50	45	

Contd…3

Having following allocations, $X_{1,3} = 50$, $X_{1,4} = 20$, $X_{2,1} = 55$, $X_{3,1} = 30$, $X_{3,2} = 35$, $X_{3,4} = 25$

Check is that the given allocation is optimal solution of the transportation problem. If not modify it to obtain the optimal solution using uv – method.

(Note : Assume X_{ij} cell means i^{th} row and j^{th} column cell.)

8 a. There are 5 jobs to be assigned to one each to 5 mens and the associated cost matrix is as follows.

		Jobs				
		J_1	J_2	J_3	J_4	J_5
	M_1	2	8	X	5	6
	M_2	0	1	8	2	6
Men	M_3	5	6	1	4	X
	M_4	7	4	8	2	3
	M_5	5	4	0	6	7

10

Use Hungarian method of job assignment and determine the optimal assignment cost.

[Note: 'X' mark in the matrix indicates that corresponding assignments are restricted].

b. Solve the following transportation problem suing VAM method. Unit transportation cost from plants to distribution centres, supply and demand are given in the following transportation table.

Distribution centres

		D_1	D_2	D_3	D_4	Supply
	P_1	2	3	11	7	6
Plants	P_2	1	0	6	1	1
	P_3	5	8	15	9	10
	Demand	7	5	3	2	

10

UNIT - V

9 a. Explain the following: i) Pure strategy ii) Optimal strategy iii) Pay – off – matrix iv) Two person zero – sum game. 8

b. Solve the following game using Dominance rule.

Player B

		I	II	III	IV
	I	6	8	3	13
Player A	II	4	1	5	3
	III	8	10	4	12
	IV	3	6	7	12

8

Contd…4

c. Find out the saddle point in the following game, 4

		Player B			
		B_1	B_2	B_3	B_4
Player A	A_1	20	15	12	35
	A_2	25	14	8	10
	A_3	40	2	10	5
	A_4	-5	4	11	0

10 a. Solve the following game using graphical method. 10

		Player B	
		B_1	B_2
Player A	A_1	1	-3
	A_2	3	5
	A_3	-1	6
	A_4	4	1
	A_5	2	2
	A_6	-5	0

b. Write a short note on: 10

i) Simulated Annealing ii) Tabu search.

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