



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

(An Autonomous Institution affiliated to VTU, Belagavi)

**Second Semester, Master of Computer Applications (MCA)**

**Semester End Examination; May/June - 2018**

## Operation Research

*Time: 3 hrs*

*Max. Marks: 100*

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

### UNIT - I

- 1 a. List the six Phases of OR study and write the advantages and limitations of Operation Research study. 10
- b. A marketing managers wishes to allocate his annual advertising budget of Rs 20,000 in two media groups M and N. The unit cost of the message in media M is Rs 200 and N is Rs 300. The media M is monthly magazine and not more than two insertions are desired in one issue. Atleast five messages should appear in the media N. The expected effective audience per unit message for media M is 4,000 and for N is 5,000. Formulate the problem as a linear programming problem. 10
- 2 a. Write short note on area of applications of operation research. 6
- b. Write the general form of a Linear Programming Problem (LPP) with usual notation. 6
- c. Solve the LPP by geographical method; 8
- Minimize  $Z = 20x + 10y$
- Such that  $x+2y \leq 40$ ;  $3x+y \geq 30$ ;  $4x + 3y \geq 60$  and  $x \geq 0, y \geq 0$

### UNIT - II

- 3 a. Explain the following related to LPP; 8
- i) Feasible solution    ii) No solution    iii) Unbounded solution    iv) Optimal solution
- b. Solve the following LPP by simplex method; 12
- Max  $Z = 3x_1 + 2x_2$
- Subjected to  $x_1 + x_2 \leq 4$ ;  $x_1 - x_2 \leq 2$  and  $x_1, x_2 \geq 0$
- 4 a. Define Slack, Surplus, Artificial variables with an example for an each 6
- b. What is degeneracy in a LPP and how do you resolve it? 4
- c. Solve the LPP using Big-M method; 10
- Maximize  $Z = 6x + 4y$
- Such that  $2x + 3y \leq 30$ ;  $3x + 2y \leq 24$ ;  $x + y \geq 3$ ;  $x, y \geq 0$

### UNIT - III

- 5 a. Write the dual of the following primal problems : 10
- i) Max  $Z = x_1 + 2x_2 + x_3$
- Show that  $2x_1 + x_2 - x_3 \leq 2$ ;  $-2x_1 + x_2 - 5x_3 \geq -6$ ;  $4x_1 + x_2 + x_3 \leq 6$ ,  $x_1, x_2, x_3 \geq 0$
- ii) Min  $Z = 0.4x_1 + 0.5x_2$
- Show that  $0.3x_1 + 0.1x_2 \leq 2.7$ ;  $0.5x_1 + 0.4x_2 \geq 6$ ,  $x_1, x_2 \geq 0$

- b. Explain the following terms in post optimality analysis : 10  
 i) Re-optimization ii) Parametric linear programming iii) Shadow prices iv) Sensitivity analysis
- 6 a. Explain the role of duality theory in sensitivity analysis (Changes). 10  
 b. Write the steps involved in Dual simplex method. 10

**UNIT - IV**

- 7 a. Obtain the initial basic feasible solution of the transportation problem (Cost in Rupees) by;  
 i)North-West corner rule      ii) Least Cost method      iii) Vogel’s approximation method

	Destination			
	2	7	4	5
Origin	3	3	1	8
	5	4	7	7
	1	6	2	14
		8	8	18

- b. Explain degeneracy in transformation problem and unbalance transformation problem. 5
- 8 a. Explain the general Assignment problem, Unbalanced assignment problem, Maximization type assignment problem. 8
- b. Solve the following assignment problem when the entries indicate the profits by assigning jobs to persons. Who will be the idle person?

	J <sub>1</sub>	J <sub>2</sub>	J <sub>3</sub>	J <sub>4</sub>	
P <sub>1</sub>	11	3	5	8	12
P <sub>2</sub>	9	9	8	4	
P <sub>3</sub>	10	3	5	10	
P <sub>4</sub>	4	13	12	11	
P <sub>5</sub>	8	9	10	4	

**UNIT - V**

- 9 a. Write the steps in Basic Simulated Annealing algorithm. 6  
 b. Explain Briefly Meta heuristics and its nature. 7  
 c. Explain with an example, how to find minimal spanning tree problem with constraints? 7
- 10 a. Solve the game Whose pay off matrix is giving by,

		B			
		1	3	1	6
A	0	-4	-3		
	1	5	-1		

- b. Using dominance property solve the where pay off matrix of player A is given

		B					
		2	4	3	8	4	7
A	5	6	3	7	8		
	6	7	9	8	7		
	4	2	8	4	3		

- c. Solve graphically the following 2 x 3 game

		B			
		1	3	11	7
A	8	5	2		