B.Com(BIM) DEGREE EXAMINATION,APRIL 2019
I Year II Semester
Elements of Operations Research

Time : 3 Hours **Max.marks :75**

Section A $(10 \times 2 = 20)$ Marks

Answer any **TEN** questions

1. What is operations research?
2. List out few techniques of OR models.
3. What is saddle point?
4. How would you solve an unbalanced transportation problem?
5. What is a slack variable?
6. What is degeneracy in Transportation?
7. Explain Pure Strategy Vs. Mixed Strategy
8. Write shorts notes on Hungarian Method.
9. Find the minimum cost solution for the following transportation problem

	To			Availabilities
From	16	19	12	14
	22	13	19	16
	14	28	18	12
Requirements	10	15	17	

Use Least Cost Method.

10. Using dominance principle reduce the following game to a 2 x 4 game and solve it

	Player B				
Player A		I	II	III	IV
	I	8	15	-4	2
	II	19	15	17	16
	III	0	20	15	5

11. A Company produces two types of pens A & B. Profits on the Pen A & B are Rs.5 and Rs.3 respectively. Raw materials required for each pen A is twice that of Pen B. The supply of raw material is sufficient only for 1000 pens of B per day. Pen A requires a special clip and only 400 clips are available per day. For Pen B only 700 clips are available per day. Prepare LPP formulation.
12. What do you mean by dominance rule?

Section B $(5 \times 5 = 25)$ Marks

Answer any **FIVE** questions

13. Explain the characterstic and features of Operations Research.
14. What are the basic assumptions of a game theory?
15. Explain the advantages and Limitations of Linear Programming.
16. Explain the relevance of Assignment problem in business decisions.
17. Find the minimum cost solution for the following transportation problem using NWCR

	To					Availabilities
From	4	1	2	6	9	100
	6	4	3	5	7	120
	5	2	6	4	8	120
Requirements	40	50	70	90	90	

18. Solve by Simplex method

    Minimize $Z = 2x_2 + x_2$

    Subject to $3x_1 + x_2 = 3$

    $4x_1 + 3x_2 > 6$

    $x_1 + 2x_2 < 4$

    $x_1, x_2 > 0$

19. Find the optimal solution for the assignment problem with the following cost matrix

	Area				
Salesman		W	X	Y	Z
	A	11	17	8	16
	B	9	7	12	6
	C	13	16	15	12
	D	14	10	12	11

Section C $(2 \times 15 = 30)$ Marks

Answer any **TWO** questions

20. Solve the following LPP by graphical method.

    Maximise $Z = 2x + 3y$

    Subject to $3x + 2y \leq 12$

    $3x + 5y \leq 15$

    $x, y \geq 0$

21. A Project work consists of four major jobs for which four major contractors have submitted tenders. The tender documents quoted in thousands of Rs. are given with the matrix as

Jobs					
Contractors		J1	J2	J3	J4
	C1	15	27	35	20
	C2	21	29	33	17
	C3	17	25	37	15
	C4	14	31	39	21

Find the assignment which minimises the total project cost.

22. A Company has three plants at locations A, B, C which supplies to the warehouses located at D, E, F, G and H. Monthly plant capacities are 800, 500 and 900 units respectively. Monthly warehouses requirements are 400, 400, 500, 400 and 800 respectively. Unit transportation costs (in Rs.) are given below:

To						
From		D	E	F	G	H
	A	5	8	6	6	3
	B	4	7	7	6	6
	C	8	4	6	6	3

Determine an optimum distribution for the company in order to minimize the total transportation model.

23. Using dominance principle to simplify the rectangular game with the following pay of matrix, and solve it graphically

Player B					
Player A		I	II	III	IV
	I	18	4	6	4
	II	6	2	13	7
	III	11	5	17	3
	IV	7	6	12	2