

**BIRLA INSTITUTE OF TECHNOLOGY, MESRA, RANCHI  
(END SEMESTER EXAMINATION)**

CLASS: MBA  
BRANCH: MANAGEMENT

SEMESTER: II  
SESSION: SP/19

SUBJECT: MT412 OPERATIONS RESEARCH

TIME: 3 Hours

FULL MARKS: 50

**INSTRUCTIONS:**

1. The question paper contains 5 questions each of 10 marks and total 50 marks.
2. Attempt all questions.
3. The missing data, if any, may be assumed suitably.
4. Before attempting the question paper, be sure that you have got the correct question paper.
5. Tables/Data hand book/Graph paper etc. to be supplied to the candidates in the examination hall.

Q.1(a) Explain how and why operations research methods have been valuable in aiding executive decisions. [5]

Q.1(b) Explain the different types of models used in operation research. [5]

Q.2(a) Use the graphical method to solve the following LP problem [5]

Minimize:  $Z = 20x_1 + 10x_2$   
 Subject to constraints  
 $x_1 + 2x_2 \leq 40$   
 $3x_1 + x_2 \geq 30$   
 $4x_1 + 3x_2 \geq 60$   
 $x_1, x_2 \geq 0$

Q.2(b) Use the Big - M method to solve the following LP problem [5]

Minimize:  $Z = 5x_1 + 3x_2$   
 Subject to constraints  
 $2x_1 + 4x_2 \leq 12$   
 $2x_1 + 2x_2 = 10$   
 $5x_1 + 2x_2 \geq 10$   
 $x_1, x_2 \geq 0$

Q.3(a) A manufacturer wants to ship 22 loads of his product as shown below. The matrix gives the kilometre from sources of supply to the destination. [5]

		Destination						
				↔				
		D <sub>1</sub>	D <sub>2</sub>	D <sub>3</sub>	D <sub>4</sub>	D <sub>5</sub>	Supply	
Source	↑							
		S <sub>1</sub>	5	8	6	6	3	8
		S <sub>2</sub>	4	7	7	6	5	5
	↓	S <sub>3</sub>	8	4	6	6	4	9
	Demand	4	4	5	4	8	22 25	

Shipping cost is Rs. 10 per load per kilometres. What shipping schedule should be used to minimise total transportation cost?

Q.3(b) A department has five employees with five jobs to be performed. The time (in hours) each men will take to perform each job is given in the effectiveness matrix. [5]

	Employees				
	I	II	III	IV	V
A	10	5	13	15	16
B	3	9	18	13	6
C	10	7	2	2	2
D	7	11	9	7	12
E	7	9	10	4	12

How should the jobs be allocated so as to minimise the total man hours?

Q.4(a) Explain the following terms: [5]

- (i) Minimax and Maximin principles (game theory)                      (ii) Mixed strategies in game theory

Q.4(b) Solve the game whose payoff matrix is given below: [5]

		Player B			
		B <sub>1</sub>	B <sub>2</sub>	B <sub>3</sub>	B <sub>4</sub>
Player A	A <sub>1</sub>	3	2	4	0
	A <sub>2</sub>	3	4	2	4
	A <sub>3</sub>	4	2	4	0
	A <sub>4</sub>	0	4	0	8

Q.5(a) What is replacement? Describe some important replacement situations. [5]

Q.5(b) A firm is considering replacement of a machine, whose cost price is Rs. 12,200 and the scrap value Rs. 200. The running (Maintenance and operating) costs are found from experience to be as follows. [5]

Year	1	2	3	4	5	6	7	8
Running cost (Rs.)	200	500	800	1200	1800	2500	3200	4000

When should be machine be replaced?

.....29/04/2019 M:.....