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

CLASS: MBA **SEMESTER : II**
BRANCH: MBA **SESSION : SP/2023**

SUBJECT: MT412 OPERATION 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 operation research methods have been valuable in aiding executive decisions. [5]

Q.1(b) An electronic company produces three types of parts for automatic washing machines. It purchases casting of the parts from a local foundry and then finishes the part on drilling, shaping and polishing machines. [5]

The selling prices of parts A, B and C respectively are Rs. 8, Rs. 10 and Rs. 14. All parts made can be sold. Casting for parts A, B and C respectively cost Rs. 5, Rs 6 and Rs.10.

The shop processed only one of each type of machine. Costs per hour to run each of the three machines are Rs 20 for drilling, Rs. 30 for shaping and Rs 30 for polishing. The capacities (parts per hour) for each part on each machine are shown in the following table.

Machine	Capacity per Hour		
	Part A	Part B	Part C
Drilling	25	40	25
Shaping	25	20	20
Polishing	40	30	40

The management of the shop wants to know how many parts of each type it should produce per hour in order to maximise profit for an hour's run. Formulate this problem as an LP model so as to maximise total profit to the company.

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

Maximize $Z=2X_1+X_2$
Subject to constraints
$X_1+2X_2 \leq 10$
$X_1+X_2 \leq 6$
$X_1-X_2 \leq 2$
$X_1-2X_2 \leq 1$
$X_1, X2 \geq 0$

Q.2(b) Use dominance rules to reduce the size of the following pay off matrix (2x2) size and hence find the optional strategies and value of the game. [5]

Player A	Player B			
	B_1	B_2	B_3	B_4
A_1	3	2	4	0
A_2	3	4	2	4
A_3	4	2	4	0
A4	0	4	0	8

Q.3 Solve the problem by Dual Simplex Method [10]

Min $Z= X_1+2X_2+3X_3$
Subject to constraints
$X_1-X_2+X_3 \geq 4$
$X_1+X_2+2X_3 \leq 8$
$X_2-X_3 \geq 2$
$X_1, X_2, X_3 \geq 0$

PTO

Q.4(a) Solve the following transportation problem (minimization) [5]

	I	II	III	Supply
A	5	1	7	10
B	6	4	6	80
C	3	2	5	15
Demand	75	20	50	

Q.4(b) Solve the Assignment problem (minimization) [5]

	1	2	2	4	5
A	75	80	85	70	90
B	91	71	82	75	85
C	78	90	85	80	80
D	65	75	88	85	90

Q.5(a) Describe the problem of replacement of items whose maintenance cost increase with time. Assume that the value of money remains constant. [5]

Q.5(b) Solve the following game by using maximin (minimax) principle whose payoff matrix in given below. Does the game have a saddle point? Find the value of the game. [5]

Firm A	Firm B				
	B_1	B_2	B_3	B_4	B_5
A_1	3	-1	4	6	7
A_2	-1	8	2	4	12
A_3	16	8	6	14	12
A_4	1	11	-4	2	1

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