BIRLA INSTITUTE OF TECHNOLOGY MESRA, RANCHI
END SEMESTER EXAMINATION

Subject: MT 412 Operation Research

Time: 2 Hrs. **MBA-2nd Semester**

Note: Use of Graph papers Allowed. **Total marks: 50**

Short Answers - 2 marks each (2X10=20)

Q1. In a graphical solution of a linear programming problem, what is a feasible region?

Q2. What is slack and surplus variable in a linear programming problem?

Q3. What is unbalanced transportation problem?

Q4. Name the methods of arriving at an initial solution in transportation problem.

Q5. What is the test for optimality called in transportation problems?

Q6. What is degeneracy in transportation problems

Q7. What is Hungarian Method?

Q8. What is Two Person Zero Sum Game and Saddle Point in Theory of Games?

Q9. What is Maximin and Minimax in Theory of Games?

Q10. When a machine is replaced whose running cost increases with time and value of money remains constant during a period

Numerical Problems - 5 marks each (5X6=30)

Q11. A manufacturing company is engaged in producing three types of products: A, B and C. The production department produces, each day, components sufficient to make 50 units of A, 25 units of B and 30 units of C. The management is confronted with the problem of optimizing the daily production of products in assembly department where only 100 man-hours are available daily to assemble the products. The following additional information is available.

Type of Product	Profit Contribution per Unit of Product (Rs.)	Assembly Time per Product (hrs)
A	12	0.8
B	20	1.7
C	45	2.5

The company has a daily order commitment for 20 units of product A and a total of 15 units of products B and C. Formulate this problem as an LP model so as to maximize the total profit.

Q.12 Use the graphical method to solve the following LP problem.

Maximize $Z=7x_1+3x_2$

Subject to the constraints

$X_1+2x_2 \geq 3$

$x_1 + x_2 \leq 4$

$0 \leq x_1 \leq 5/2$

$0 \leq x_2 \leq 3/2$

$x_1, x_2 \geq 0$

Q.13 Determine an initial basic feasible solution to the following transportation problem be using VAM method.

Destination

	D1	D2	D3	D4	Supply
S1	21	16	15	3	11
S2	17	18	14	23	13
S3	32	27	18	41	19
Demand	6	10	12	15	

Q.14 Five men are available to do five different jobs. From past records, the time (in hours) that each man takes to do each job is known and given in the following table:

Jobs

		I	II	III	IV	V
Men	A	2	9	2	7	1
	B	6	8	7	6	1
	C	4	6	5	3	1
	D	4	2	7	4	1
	E	5	3	9	5	1

Find the assignment of men to jobs that will minimize the total time taken.

Q.15 Solve the following games by using maximin minimax principle whose payoff matrix are given below: Include in your answer: the value of the game to each player. Does the game have a saddle point?

(a)

Player A	B1	B2	B3	B4
A1	-5	3	1	10
A2	5	5	4	6
A3	4	-2	0	-5

(b)

Firm A	B1	B2	B3	B4	B5
A1	3	-1	4	6	7
A2	-1	8	2	4	12
A3	16	8	6	14	12
A4	1	11	-4	2	1

Q.16 The data collected in running a machine, the cost of which is Rs 60,000, are given below:

Year	1	2	3	4	5
Resale value (Rs)	42,000	30,000	20,400	14,400	9,650
Cost of Spares (Rs)	4000	4270	4880	5700	6800
Running cost (Rs)	14,000	16000	18000	21000	25000

Determine the optimum period of replacement of the machine.

25/04/2022 E