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Reg. No. : .....

Name : .....

Third Semester B.B.A. LL.B. (Five Year Integrated) Degree Examination, October 2023

Paper III – OPERATIONS RESEARCH

(2013 Admission Onwards)

Time : 3 Hours Max. Marks : 80

I. Answer any **five** of the following. Each question carries **2** marks. Answer should not exceed **50** words each.

1. What is meant by feasible solution?
2. What is scalar matrix?
3. What is maximin decision criterion?
4. What is unbalanced transportation problem?
5. What is Hungarian assignment method?
6. What is network diagram?
7. What is PERT?
8. What is two person zero sum game?

(5 × 2 = 10 Marks)

II. Answer any **four** of the following. Each question carries **4** marks. Answer should not exceed **120** words each.

1. Trace the origin of operations research.
2. State the advantages and disadvantages of Game Theory.

P.T.O.

3. What are replacement problems? When does it arise?

4. What are the assumptions of transportation problem?

5. Find inverse of B where $B = \begin{pmatrix} 3 & 5 & 7 \\ 2 & -3 & 1 \\ 1 & 1 & 2 \end{pmatrix}$.

6. Solve the following using Crammer's Rule.

$5x - 6y + 4z = 15$

$7x + 4y - 3z = 19$

$2x + y - 6z = 46$

(4 × 4 = 16 Marks)

III. Answer any **four** of the following. Each question carries 6 marks.

1. Discuss the scope of operations Research.

2. Explain simplex procedure to solve LPP.

3. Explain the principal assumptions made while dealing with sequencing problems.

4. A dairy plant manufactures two products X and Y and sells them at a profit of Rs. 5 on type X and Rs. 3 on type Y. Each product passes through two machines P and Q. Type X requires one minute of processing time on P and two minutes on Q.

   Type Y requires one minute on P and one minute on Q. The machine P is available for not more than 6 hours 40 minutes while machine Q is available for 8 hours 20 minutes during any working day.

   Formulate a mathematical model to the above.

5. Find solution of game using Saddle Point.

		Player B			
		B1	B2	B3	B4
Player A	A1	20	15	12	35
	A2	25	14	8	10
	A3	40	2	10	5
	A4	–5	4	11	0

6. If $A=\begin{pmatrix}2 & 2 & 2\\ 2 & 1 & -3\\ 1 & 0 & 4\end{pmatrix}$ $B=\begin{pmatrix}3 & 3 & 3\\ 3 & 0 & 5\\ 6 & 9 & -1\end{pmatrix}$ $C=\begin{pmatrix}4 & 4 & 4\\ 5 & -1 & 0\\ 2 & 3 & 1\end{pmatrix}$. Determine $4(7A-2B-3C)$.

(4 × 6 = 24 Marks)

IV. Answer any **three** of the following. Each question carries **10** marks.

1. Define operations Research. State the characteristics. Explain the phases of Operations research.

2. What is linear programming problem? Formulate a mathematical model to maximize profit for the following linear programming problem.

   An electronic company produces three types of parts for automatic washing machine. It purchases casting of the parts from a local foundry and then finishes the part of drilling, shaping and polishing machines.

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

   The shop possesses 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 how in order to maximize profit for an hour's run.

3. From the cost matrix availability at each plant and requirement at each warehouse, you are required to solve the following Transportation problem:

Plant ↓	Warehouse				Availability
	W1	W2	W3	W4	
P1	190	300	500	100	70
P2	700	300	400	600	90
P3	400	100	600	200	180
Requirement	50	80	70	100	340

4. 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) cost in rupees are found from experience to be as follows:

Year:	1	2	3	4	5	6	7	8
Running cost:	200	500	800	1200	1800	2500	3200	4000

When should the machine be replaced?

5. Find the Critical path and project duration from the following information assuming that the expected time are normally distributed.

Activity	Days		
	Optimistic time	Most likely time	Pessimistic time
1-2	2	5	14
1-3	9	12	15
2-4	5	14	17
3-4	2	5	8
3-5	8	17	20
4-5	6	9	12

(3 × 10 = 30 Marks)