2015

(5th Semester)

MATHEMATICS

Paper : MATH–354(A)

(Operations Research)

Full Marks : 75

Time : 3 hours

(PART : B—DESCRIPTIVE)

(*Marks* : 50)

The questions are of equal value

Answer **five** questions, taking **one** from each Unit

UNIT—I

1. A firm manufactures two types of product A and B, and sells them at a profit of ₹ 2 on type A and ₹ 3 on type B. Each product is processed on two machines M_1 and M_2. Type A requires one minute of processing time on M_1 and two minutes on M_2; type B requires one minute on M_1 and one minute on M_2. The machine M_1 is available for not more than 6 hours 40 minutes while machine M_2 is available for 10 hours during any working day.

Formulate the problem as linear programming problem and find how many products of each type should the firm produce each day in order to get maximum profit by graphically method.

2. A company makes two kinds of leather belts. Belt *A* is high quality belt and belt *B* is of lower quality. The respective profits are ₹ 4 and ₹ 3 per belt. Each belt of type *A* requires twice as much as that type of belt *B*. If all were of type *B*, the company could make 1000 belts per day. The supply of leather is sufficient for only 800 belts per day. Belt *A* requires a fancy buckle and only 400 buckles are available. There are only 700 buckles a day available for belt *B*. How should the company manufacture the two types of belts in order to have a maximum profit? (Use graphic method)

UNIT—II

3. Solve the given LPP by using simplex method :

$$\text{Maximize } Z = 3x_1 + 5x_2 + 4x_3$$

subject to

$$2x_1 + 3x_2 \le 8$$
$$2x_2 + 5x_3 \le 10$$
$$3x_1 + 2x_2 + 4x_3 \le 15$$

and $x_1, x_2, x_3 \ge 0$.

4. Solve the following LPP by Big-M method :

Maximize $Z = x_1 + 2x_2 + 3x_3 - x_4$

subject to

$$x_1 + 2x_2 + 3x_3 = 15$$
$$2x_1 + x_2 + 5x_3 = 20$$
$$x_1 + 2x_2 + x_1 + x_4 = 10$$

and $x_1, x_2, x_3, x_4 \geq 0$.

UNIT—III

5. Four different jobs can be done on four different machines. The set up and take-down time costs are assumed to be prohibitively high for changeovers. The matrix below gives the cost in rupees of producing job i on machine j :

	M_1	M_2	M_3	M_4
J_1	5	7	11	6
J_2	8	5	9	6
J_3	4	7	10	7
J_4	10	4	8	3

How should the jobs be assigned to the various machines so that the total cost is minimized?

6. The following data describe a transportation problem :

Source	D_1	D_2	D_3	*Supply*
S_1	9	8	5	25
S_2	6	8	4	35
S_3	7	6	9	40
Demand	30	25	45	100

Find the initial solution by using *(a)* North-West corner method, *(b)* least cost method and *(c)* Vogel's approximation method.

UNIT—IV

7. Solve the following LPP by Gomory technique :

Maximize $Z = 3x_2$

subject to the constraints

$$3x_1 + 2x_2 \leq 7$$

$$x_1 - x_2 \geq -2$$

$x_1, x_2 \geq 0$ and are integers.

8. Use branch and bound technique to solve the following mixed integer problem :

Maximize $Z = x_1 + x_2$

subject to

$$2x_1 + 5x_2 \leq 16$$

$$6x_1 + 5x_2 \leq 30$$

$x_1 \geq 0,\ x_2 \geq 0$ and are integers.

UNIT—V

9. Solve the following game by using the principle of dominance :

$$\begin{array}{cc} & \textit{Player B} \\ \textit{Player A} & \begin{pmatrix} 4 & 2 & 0 & 2 & 1 & 1 \\ 4 & 3 & 1 & 3 & 2 & 2 \\ 4 & 3 & 7 & -5 & 1 & 2 \\ 4 & 3 & 4 & -1 & 2 & 2 \\ 4 & 3 & 3 & -2 & 2 & 2 \end{pmatrix} \end{array}$$

10. Solve the game by graphical method, whose payoff matrix is given below :

$$\begin{array}{cc} & \textit{Player B} \\ \textit{Player A} & \begin{pmatrix} 4 & -2 & 3 & -1 \\ -1 & 2 & 0 & 1 \\ -2 & 1 & -2 & 0 \end{pmatrix} \end{array}$$

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2015

(5th Semester)

MATHEMATICS

Paper : MATH–354(A)

(Operations Research)

(PART : A—OBJECTIVE)

(*Marks* : 25)

Answer **all** questions

SECTION—I

(*Marks* : 10)

Each question carries 1 mark

Put a Tick ☑ mark against the correct answer in the box provided :

1. Operation Research (OR), which is a very powerful tool for

(a) research ☐

(b) decision-making ☐

(c) operations ☐

(d) None of the above ☐