9. Solve the following transportation problem

From	To			Available
	A	B	C	
I	50	30	220	1
II	90	45	170	3
III	250	200	50	4
Requirement	4	2	2	

(10)

10. What are opportunities and shortcomings of operational research and discuss applications of operational research.

(10)

11. A stenographer has 5 persons for whom she performs stenographic work. Arrival rate is Poisson and service time is exponential. Average arrival rate is 4 per hour with an average service time of 10 minutes. Find.

(a) The average waiting time for an arrival.

(b) The average length of waiting line.

(10)

The candidates shall limit their answers precisely within the answer-book (40 pages) issued to them and no supplementary/continuation sheet will be issued.

Note : (i)   Attempt all parts of questions in Section-A.

(ii) Attempt any four questions from Section-B.

(iii) Attempt any two questions from Section-C.

SECTION - A (Do all parts)

1. (a) State the feature of Operational Research.

(b) Indicate the difference between decision under risk and decision under uncertainty in decision making.

(c) What is a decision tree?

(d) Define the terms basic solution and basic feasible solution.

(e) Distinguish between PERT and CPM.

(f) What is transhipment problem?

(g) Explain the terms pure strategy, mixed strategy and saddle point.

(h) What is Queue discipline?

[P.T.O.]

(i) What is replacement problem?

(j) Enumerate the various types of inventory models.

(2×10=20)

SECTION - B (Do any four questions)

2. Explain briefly the applications of operational research. (5)

3. Explain clearly the term decision in a decision making problem. What are the basic steps of a decision making process? (5)

4. Use the graphical method to solve the linear programming problem:

Maximize $z = 2x_1 + 3x_2$

subject to constraints

$x_1 + x_2 \leq 30$

$x_1 - x_2 \geq 0$

$x_2 \geq 3,\ 0 \leq x_1 \leq 20$ and $0 \leq x_2 \leq 12$ (5)

5. For the game with pay off matrix

Player A

Player B $\begin{bmatrix} -1 & 2 & -2 \\ 6 & 4 & -6 \end{bmatrix}$

Determine the best strategies for player A and B and value of game for them. (5)

6. A firm is considering replacement of a machine whose cost price is Rs. 12200 and 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)

7. 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 table.

Jobs

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

Find the assignment of men to jobs that will minimize the total time taken. (5)

SECTION - C (Do any two questions)

8. Use simplex method to minimize $z = x_2 - 3x_3 + 2x_5$ subject to the constraints

$3x_2 - x_3 + 2x_5 \leq 7,\ - 2x_2 + 4x_3 \leq 12,$

$-4x_2 + 3x_3 + 8x_5 \leq 10$ and $x_2,\ x_3,\ x_5 \geq 0$ (10)

[P.T.O.]