Operations Research

UNIT – I

Section – A

1. Define linear programming problem.
2. Write the standard for of an LPP.
3. Define “Operations Research”.
4. What are the uses of OR?
5. What are the decision variable in an OR model?
6. Define. Basic Feasible Solution.
7. Define Feasible Solution
8. Define Dynamic Models.

Section – B

1. Explain briefly about operations Research and decision-making.
2. Rewrite in standard from the following Linear Programming Problems.

   (i)Minimize $z = 2x_1 + x_2 + 4x_3$

   Subject to the constraints

   $-2x_1 + 4x_2 \leq 4;\ \ x_1+2x_2+x_3 \geq 5;$

   $2x_1+3x_2 \leq 2;\ \ x_1,x_2 \geq 0$ and x_3

   unrestricted in sign.

   (ii) Maximize $z = 3x_1 - 4x_2 + 7x$

   Subject to the constraints

   $+2x_1 + x_2 + 2x_3 \geq 6;\ \ 3x_1+2x_2=8$

   $7x_1-3x_2-5x_3 \geq 9;\ \ x_1,x_2,x_3 \geq 0$
3. Explain the basic characteristics of OR
4. Explain the various classifications of OR models.
5. Explain the simplex procedure for soling an LPP.
6. Solve the following LPP by graphical method

   Minimize : $z = 20x_1 + 40x_2$

   Subject to : $36x_1 + 6x_2 \geq 108$

$3x_1 + 12x_2 \geq 36$

$20x_1 + 10x_2 \geq 100, \ x_1, x_2 \geq 0$

7. Rule of OR in business and Management.
8. Principal of Modeling.
9. Procedure for forming a LPP model

Section – C

1. Use Simplex methods to solve the LPP

   $Max: z = 3x_1 + 2x_2$

   Subject to : $x_1 + x_2 \leq 6$

   $2x_1 + x_2 \leq 6, \ x_1, x_2 \geq 0$
2. Explain the different phases of OR.
3. Explain various types of models used in OR giving suitable example.
4. Solve the following LPP by the graphical Method : $Max \ z = 4x_1 + 3x_2$

   Suject to the constraints $x_1 - x_2 \leq -1$.

   $x_1 + x_2 \leq 0 \ and \ x_1, x_2 >, 0$.

UNIT –II

Section – A

1. Define optimum solution.
2. Define assignment problem.
3. What is the use of artificial variable in LPP?
4. Explain dual simplex method.
5. Define transportation problem.
6. Define Surplus variable.
7. Define L.P.P

Section – B

1. Write the difference between the transportation problem and the Assignment problem.

2. Solve the following the Assignment problem.

	A	B	C	D
1	10	25	15	20
2	15	30	5	15
3	35	20	12	24
4	17	25	24	20

3. Use dual simplex to solve the following LPP Minimize $z = 3x_1 + x_2$

Subject to : $x_1 + x_2 \geq 1$; $2x_1 + 3x_2 \geq 2, x_1, x_2 \geq 0$

4. Use Big M-Method to solve the LPP

Subject to : $2x_1 + 3x_2 \leq 30$

$3x_1 + 2x_2 \leq 24$

$x_1 + x_2 \geq 3, x_1, x_2 \geq 0$

5. Find an optimum assignment schedule for the following.

	I	II	III	IV	V
A	10	11	4	2	8
B	7	11	10	14	12
C	5	6	9	12	14
D	13	15	11	10	7

6. Explain the degenerate solution in TP.

Section – C

1. Use simplex method, Solve.

$Max\ Z = x_1 + 2x_2 + 3x_3$

Subject to $x_1 + 2x_2 + 3x_3 \leq 10$

$x_1 + x_2 \leq 5;$

$x_1, x_2, x_3 \geq 0$

2. Write two-phase methods procedure of solving an LPP.

3. Use simplex method solve the following

$Max\ z = 10x_1 + x_2 + 2x_3$

Subject constraints $x_1 + x_2 - 2x_3 \leq 10;$

$4x_1 + x_2 + x_3 \leq 20;\ x_1, x_2, x_3 \geq 0$

4. Use simplex method to solve the maximize $z = 4x_1 + 10x_2$

Subject constraints $2x_1 + x_2 \le 50, 2x_1 + 5x_2 \le 100$

$2x_1 + 3x_2 \le 90$ *and* $x_1, x_2 \ge 0$

5. Infinite solution of graphical method $\max z = 100x + 400x_2$
subject to the
constraints. $5x_1 + 2x_2 \le 1000, 3x_1 + 2x_2 \le 900$

$x_1 + 2x_2 \le 500$ *and* $x_1, x_2 \ge 0$.

6. Big – M Method Algorithm

UNIT – III

Section – A

1. Define sequencing problem.
2. Define replacement problem.
3. What is unbalanced transportation problem?
4. Write the Mathematical form of an Assignment problem.
5. Define sequencing.
6. Define replacement problem.

Section – B

1. Explain the individual replacement problem and group replacement problem.
2. Write MODI method of solving a Transportation problem.
3. Solve the following assignment problem.

	Men			
Work	1	2	3	4
A	18	26	17	11
B	13	28	14	26
C	38	19	18	15
D	19	26	24	10

4. Explain the situations when the replacement of certain items is to be done.
5. The cost of a machine is Rs. 6,000 and its scrap value is Rs. 100. The maintenance cost found from experience are as follows:

year	:	1	2	3	4	5	6	7	8
Maintenance Cost	:	100	200	400	600	900	1200	1600	2000

Section – C

1. Solve the transportation problem.

	D_1	D_2	D_3	D_4	*Supply*
S_1	6	1	9	3	70
S_2	11	5	2	8	55
S_3	10	12	4	7	70
Demand	85	35	50	45	

2. Determine the optimal solution to the following transportation problem. Use Vogel's approximation method to find initial solution.

3. Solve the following the transportation problem.

$$\begin{array}{c} \\ I \\ II \\ III \\ \\ \end{array}\begin{array}{c} \begin{array}{cccc} P & Q & R & S \end{array} \\ \begin{pmatrix} 1 & 2 & 3 & 4 \\ 4 & 3 & 2 & 0 \\ 0 & 2 & 2 & 1 \end{pmatrix} \\ \begin{array}{cccc} 4 & 6 & 8 & 6 \end{array} \end{array}\begin{array}{c} \\ 6 \\ 8 \\ 10 \\ \\ \end{array}$$

4. Advantage of Linear Programming.

UNIT IV

Section – A

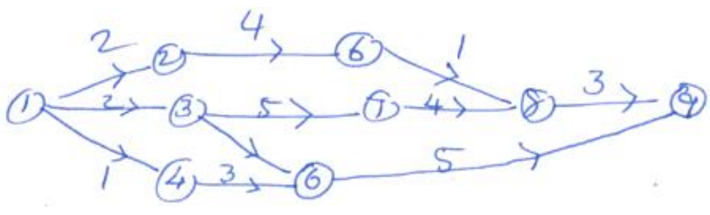
1. Define critical path.
2. Define Network.
3. What is Measnt by traffic intensity?
4. Define two-person zero-sum game?
5. Expand PERT.
6. Define slack time.

Section – B

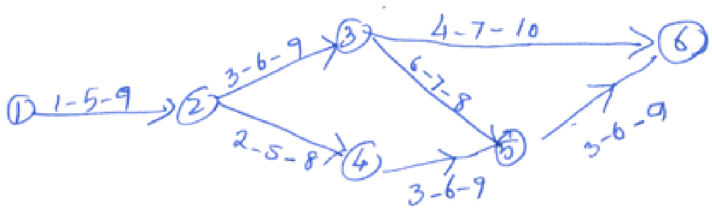
1. Distinguish between PERT and CPM.
2. Explain about the operating characteristic of queuing system.
3. Solve the following game graphically.

$$\begin{array}{c} \\ A_1 \\ A_2 \\ A_3 \\ A_4 \\ A_5 \\ A_6 \end{array} \begin{array}{c} \begin{array}{cc} B_1 & B_2 \end{array} \\ \begin{pmatrix} 1 & -3 \\ 3 & 5 \\ -1 & 6 \\ 4 & 1 \\ 2 & 2 \\ -5 & 0 \end{pmatrix} \end{array}$$

4. Find the critical path



5. For the following network, compute the length and variance of the critical path.



Section – C

1. Solve the following sequencing problem:

Job	*A*	*B*	*C*	*D*	*E*	*F*	*G*
M_1	3	8	7	4	9	8	7
M_2	4	3	2	5	1	4	3
M_3	6	7	5	11	5	6	12

2. Discuss about $M/M/1/\infty : FIFO$ queuing model.

3. Explain the various situations when the replacement of certain items is to be done.

UNIT – V

Section – A

1. Define shortage cost.

2. Define lead-time.

3. Define a Network diagram.

4. Write a note on total float and free float.

5. Define Inventory cost.

Section – B

1. Explain the various reasons for carrying inventories.

2. Discuss the procedure of critical path calculating in CPM.

3. Give the following information:

Activity	*Time Estimates*		
$i-j$	t_o	t_m	t_p
1 – 2	6	6	24
1 – 3	6	12	18
1 – 4	12	12	30
2 – 5	6	6	6
3 – 5	12	30	48
4 – 6	12	30	54
5 – 6			

(a) What is the expected project length?

(b) Calculate the variance and standard deviation of project length.

4. Explain the various types of inventory.

5. Explain the various reasons for carrying inventories.

Section-C

1. The demand rate for a particular item is 12,000 units per year. The ordering cost is Rs. 100 per order and the holding cost is Rs. 0.80 per item per month. If no shortages, calculate EOQ and minimum cost.

2. Given the following information:

Activity	0 – 1	1 – 2	1 – 3	2 – 4	2 – 5	3 – 4	3 – 6	4 – 7	5 – 7	6 – 7
Duration(*days*)	2	8	10	6	3	3	7	5	2	8

Draw network diagram, identifying critical path and find the total project duration.

3. Obtain EOQ formula for the following.

(a) Purchasing problem with shortages.

(b) Producing problem with shortages.