

18/12/19

(REVISED COURSE)

(3 Hours)

[Total Marks: 80]

N.B. :

1. Question 1 is compulsory.
2. Attempt any 3 more from the remaining questions.
3. Assume data if necessary and specify the assumption clearly.
4. Use graph paper, if required.
5. Answer to the Sub-questions of an individual question should be grouped and written together i.e. one below the other.

1. (a) Solve graphically following LP :

Max $Z = 5x_1 + 3x_2$
 s.t. $3x_1 + 5x_2 \leq 15$
 $5x_1 + 2x_2 \leq 10$
 $x_1, x_2 \geq 0$

Solⁿ: Maximize [10]

$Z = 12.5$
 and $x_1 = 1$
 $x_2 = 2.5$

(b) Write down dual form of following LPP:

Max $Z = 2x_1 + 3x_2 + x_3$
 s.t. $4x_1 + 3x_2 + x_3 = 6$
 $x_1 + 2x_2 + 5x_3 = 4$
 $x_1, x_2, x_3 \geq 0$

Solⁿ: [05]

Mini $Z_v = 6V_1 + 4V_2$
 st. $4V_1 + V_2 \geq 2$
 $3V_2 + 2V_2 \geq 3$
 [05]

(c) Explain advantages and Disadvantages of Simplex method.

2. (a) Solve following LP by Simplex Method:

Max $Z = 12x_1 + 15x_2 + 14x_3$
 s.t. $-x_1 + x_2 \leq 0$
 $-x_1 + 2x_3 \leq 0$
 $x_1 + x_2 + x_3 \leq 100$
 $x_1, x_2, x_3 \geq 0$

Solⁿ: [12]

$x_1 = 40$
 $x_2 = 40$
 $x_3 = 20$
 $Z_{max} = 1360$

(b) Explain concept of duality in linear programming . Also write duality theorem. [08]

3. (a) A car hire company has one car at each of five depots a, b, c, d, and e. A customer requires a car in each town namely A, B, C, D, and E. Distance in km between depots(origin) and towns(destinations) are following distance matrix. How should he car assigned to the so as minimize the distance travelled? [10]

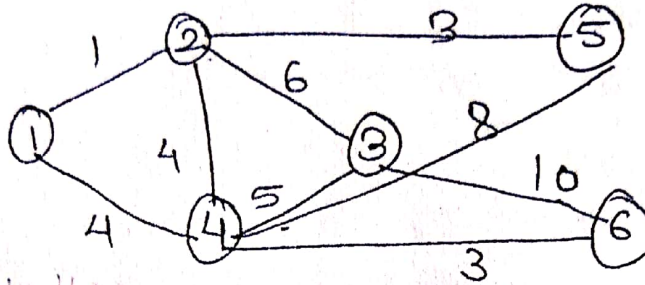
	a	b	c	d	e
A	160	130	175	190	200
B	135	120	130	160	175
C	140	110	155	170	185
D	50	50	50	80	110
E	55	35	70	80	105

Route A-e B-c c-b D-a E-d
 Distance (km) 200 130 110 50 80

Total Distn Travelled 570 km

76486

- (b) A 'T.V.' cable company is in the process of planning a network for providing T.V. service to five new housing development areas. The cable system is summarized in fig. Determine the link that will result in use of minimum cable mines while guaranting that all areas are connected to T.V. station. Node 1:relay station. 2 to 6 are development areas. Distance are shown in miles. [10]



4. Solve the following IP by Branch and Bound Method: [20]
- $$\begin{aligned} \text{Max } z &= 3x_1 + 5x_2 \\ \text{s.t. } 9x_1 + 5x_2 &\leq 45 \\ x_1 + x_2 &\leq 6 \\ x_1, x_2 &\geq 0 \end{aligned}$$
- soln \Rightarrow
optimal soln is
 $Z_{\max} = 40$
at $x_1 = 5$
 $x_2 = 0$

5. (a) What do you mean by Economic Order Quantity (EOQ). Explain static model with price breaks. [10]

- (b) A shopkeeper purchase soaps at the rate of Rs.10 per piece from a vendor. The requirement of soaps is 1000 per year. Then find 1)Quantity of per order 2) No of orders placed per year and 3)Total inventory cost per year, if the cost of per placement of an order is Rs. 4 and inventory carrying charge per rupee per year is only 10 Paise. [10]

1) 89 soaps
2) 44.7 order
45 / year
3) 22.36
6.27

1) 89 soaps
2) 45 orders/year
3) 22.36

Write a note on:

1. Elements of queuing model
2. Pure Birth and Death model
3. Dynamic EOQ model

[06]

[07]

[07]