

Total No. of Questions : 6]

SEAT No. :

**P284**

**Oct./BE/Insem.-602**

[Total No. of Pages : 2

**B.E. (Computer Engineering)**

**OPERATIONS RESEARCH**

**(2015 Pattern) (Semester - I) (Elective - II) (410245 C)**

*Time : 1 Hour]*

*[Max. Marks : 30*

*Instructions to the candidates:*

- 1) *Answer Q1 or Q2, Q3 or Q4, and Q5 or Q6.*
- 2) *Neat diagrams must be drawn wherever necessary.*
- 3) *Figures to the right indicate full marks.*
- 4) *Assume suitable data, if necessary.*

**Q1) a)** List and explain the properties of a Linear Programming Model. **[4]**

**b)** Solve the following two-variable linear programming problem graphically. **[6]**

$$\text{Maximize } Z = 30x_1 + 40x_2$$

Subject to constraints :

$$3x_1 + 2x_2 \leq 600$$

$$3x_1 + 5x_2 \leq 800$$

$$5x_1 + 6x_2 \leq 1100$$

$$x_1, x_2 \geq 0$$

OR

**Q2) a)** Explain how are Linear Programming Problems formulated? **[4]**

**b)** Explain the various special cases in Linear Programming Problems with suitable examples. **[6]**

**Q3) a)** Give the Correspondence between entities in primal and dual problems with an example. **[4]**

**b)** For the given LPP prove that the Dual of the Dual is the Primal. **[6]**

$$\text{Maximize } Z = 80x_1 + 60x_2 + 50x_3$$

Subject to constraints :

$$8x_1 + 6x_2 + 4x_3 \leq 100$$

$$5x_1 + 4x_2 + 4x_3 \leq 60$$

$$x_1, x_2, x_3 \geq 0$$

OR

**P.T.O.**

- Q4) a)** State the relationship between the Primal and the Dual. [4]  
**b)** Make dual for following Linear Programming Problem. [6]

$$\text{Minimize } Z = 8x_1 + 10x_2$$

Subject to constraints :

$$2x_1 + 4x_2 \geq 5$$

$$3x_1 - 5x_2 \leq 3$$

$$x_1, x_2 > 0$$

- Q5) a)** What do you mean by an Initial Basic Feasible Solution (IBFS). Explain? [4]  
**b)** A company has two manufacturing facilities at Mumbai and Pune with production capacity of 1000 and 800 products per day, respectively. Three store-houses are at Nagpur, Kolhapur and Ratnagiri with daily requirements of 900, 400 and 500 products, respectively. Transportation cost (in Rupees) per unit between the manufacturing facilities to store-houses is given in the table below. Solve the transportation problem so as to minimize the Transportation cost using the North-West-Corner Method. [6]

		Store-houses		
		Nagpur	Kolhapur	Ratnagiri
Manufacturing Facilities	Mumbai	4	8	7
	Pune	6	4	3

OR

- Q6) a)** What is an un-balanced transportation problem? Explain how do you balance it? What are the specific costs to be considered while balancing the same? Explain with an example. [4]  
**b)** A salesman has to travel between cities selling products. He visits cities A, B, C, D and E. The distance between the cities is as given in the table below. Solve the Travelling Salesman Problem, [6]  
 i) Indicate the route followed,  
 ii) Mention the distance travelled in kilometers.

		To City				
		A	B	C	D	E
From City	A	--	17	16	18	14
	B	17	--	18	15	16
	C	16	18	--	19	17
	D	18	15	19	--	18
	E	14	16	17	18	--

