

10AU71

Seventh Semester B.E. Degree Examination, Dec.2019/Jan.2020  
**Operation Research**

Time: 3 hrs.

Max. Marks:100

**Note: Answer FIVE full questions, selecting atleast TWO questions from each part.**

**PART – A**

- 1 a. Write a short note on the following :
- Area of application of operation research.
  - Discuss briefly the role of operation research in decision making process. (06 Marks)
- b. A company manufactures two products X and Y, which requires, the following resources. The resources are the capacities machine  $M_1$ ,  $M_2$  and  $M_3$ . The available capacities are 50, 25 and 15 hours respectively in the planning period. The product 'X' requires 1 hour of machine  $M_2$  and 1 hour of machine  $M_3$ . The product 'Y' requires 2 hour of machine  $M_1$ , 2 hours of machine  $M_2$  and 1 hour of machine  $M_3$ . The profit contribution of products X and Y are Rs. 5/- and R. 4/- respectively. Formulate the problem as a linear programming problem. (08 Marks)

- c. Solve the problem with graphical method :

$$\text{Max, } Z = x_1 + x_2$$

$$\text{Subject to } x_1 + x_2 \leq 1$$

$$-3x_1 + y_2 \geq 3$$

$$\text{and } x_1, x_2 \geq 0.$$

(06 Marks)

- 2 a. Use Simplex method to solve the LPP

$$\text{Min } Z = x_2 - 3x_3 + 2x_5$$

$$\text{Subject to } 3x_2 - x_3 + 2x_5 \leq 7$$

$$-2x_2 + 4x_3 \leq 12$$

$$-4x_2 + 3x_3 + 8x_5 \leq 10$$

$$x_2, x_3, x_5 \geq 0.$$

(10 Marks)

- b. Find the dual of the following LPP

$$\text{Max, } Z = 3x_1 - x_2 + x_3$$

$$\text{Subject to, } 4x_1 - x_2 \leq 8$$

$$8x_1 + x_2 + 3x_3 \geq 12$$

$$5x_1 - 6x_3 \leq 13$$

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

(10 Marks)

- 3 a. Give the mathematical formulation of transportation problem. (04 Marks)  
 b. Find the initial basic feasible solution for the following transportation problem by VAM.

		Destination				Supply
		D <sub>1</sub>	D <sub>2</sub>	D <sub>3</sub>	D <sub>4</sub>	
origin	O <sub>1</sub>	11	13	17	14	250
	O <sub>2</sub>	16	18	14	10	300
	O <sub>3</sub>	21	24	13	10	400
	Demand	200	225	275	250	950

- c. A product is produced by 4 factories F<sub>1</sub>, F<sub>2</sub>, F<sub>3</sub> and F<sub>4</sub>, their unit production cost are Rs. 2, 3, 1, and 5 respectively production capacity of the factories are 50, 70, 30 and 50 unit respectively. The product is supplied to 4 stores S<sub>1</sub>, S<sub>2</sub>, S<sub>3</sub> and S<sub>4</sub>, the requirement of which are 25, 35, 105 and 20 respectively. Unit cost of transportation are given below :  
 Find the transportation plan such that the total production and transportation cost is minimum. (06 Marks)

		Stores			
		S <sub>1</sub>	S <sub>2</sub>	S <sub>3</sub>	S <sub>4</sub>
Factory	F <sub>1</sub>	2	4	6	11
	F <sub>2</sub>	10	8	7	5
	F <sub>3</sub>	13	3	9	12
	F <sub>4</sub>	4	6	8	3

(10 Marks)

- 4 a. Write down the important difference between a transportation and an assignment problem. (04 Marks)  
 b. A company has 4 machines to do 3 jobs. Each job can be assigned to one and only one machine. The cost of each job on each machine is given below. Determine the job assignment which will minimize the total cost.

		Machine			
		W	X	Y	Z
Job	A	18	24	28	32
	B	8	13	17	18
	C	10	15	19	22

(08 Marks)

- c. A tourist organization is planning to arrange a tour of 5 historical places. Starting from the head office at A then going round B, C D and E and then come back to A. Their objective is to minimize the total distance covered. Help them in sequencing the cities. A, B, C, D and E as shown in the Fig.Q4(c). The numbers on the arrows shown the distance in km. (08 Marks)

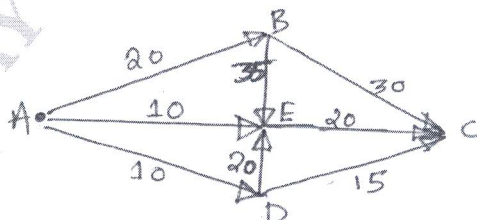


Fig.Q4(c)