

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER-VII (Old) EXAMINATION – WINTER 2019

Subject Code: 171901

Date: 05/12/2019

Subject Name: Operation Research

Time: 10:30 AM TO 01:00 PM

Total Marks: 70

Instructions:

1. Attempt all questions.
2. Make suitable assumptions wherever necessary.
3. Figures to the right indicate full marks.

- Q.1 (a)** Discuss the scope or operation research. Also state its limitations. **07**
(b) Solve the following LP problem using graphical method: **07**

$$\begin{aligned} \text{Minimize } Z &= 2x_1 + 3x_2 \\ X_1 + X_2 &\geq 6 \\ 7X_1 + X_2 &\geq 14 \\ X_1 \text{ and } X_2 &\geq 0 \end{aligned}$$

- Q.2 (a)** Solve the following LP problem using simplex method. **07**
 Minimize $Z = 10X_1 + 15X_2 + 20X_3$

$$\begin{aligned} \text{Subject To } 2X_1 + 4X_2 + 6X_3 &\leq 24 \\ 3X_1 + 9X_2 + 6X_3 &\leq 30 \\ X_1, X_2 \text{ and } X_3 &\geq 0 \end{aligned}$$

- (b)** Form the dual of the following primal problem. **07**
 (I) Minimize $Z = 20X_1 + 40X_2 + 25X_3$ (I) Maximize $Z = 4X_1 + 10X_2 + 25X_3$

$$\begin{aligned} \text{Subject To } 2X_1 + 20X_2 &\geq 40 \\ 20X_1 + 3X_2 &\geq 20 \\ 4X_1 + 15X_2 &\geq 30 \\ X_1 \text{ and } X_2 &\geq 0 \end{aligned}$$

$$\begin{aligned} \text{Subject To } 2X_1 + 4X_2 + 8X_3 &= 25 \\ 4X_1 + 9X_2 + 8X_3 &= 30 \\ 6X_1 + 8X_2 + 2X_3 &= 40 \\ X_1, X_2 \text{ and } X_3 &\geq 0 \end{aligned}$$

OR

- (b)** Write the difference between primal and dual in case of linear programming Problem. **07**

- Q.3 (a)** Consider the transportation problem shown in table **07**

		Market					Supply
		1	2	3	4	5	
Plant	1	10	2	16	14	10	300
	2	6	18	12	13	16	500
	3	8	4	14	12	10	825
	4	14	22	20	8	18	375
Demand		350	400	250	150	400	

Find the initial basic feasible solution using each of the following methods and compare their total cost. a) Northwest corner method, b) least cost cell method c) Vogel's approximation method

- (b)** Distinguish between transportation & transshipment problems in detail. **07**

OR

- Q.3 (a)** (Travelling salesman problem). A travelling salesman has to visit five cities. He is to start from particular city visits each city only once and then return back to **07**

his starting point. The travelling cost of each city from a particular city is given below. What is the sequence of his visit so that the cost is minimized?

From City	To city				
	A	B	C	D	E
A	-	3	6	2	3
B	3	-	5	2	3
C	6	5	-	6	4
D	2	2	6	-	6
E	3	3	4	6	-

- (b) Alfa construction company has five crews. The skills of the crews differ from one another because of the difference in the composition of the crews. The company has five different projects on hand. The time (in days) taken by different crews to complete different projects are summarized in table. Find the best assignment of the crew to different projects such that the total time taken to complete all the projects is minimized. 07

	Projects				
	A	B	C	D	E
1	20	30	25	15	35
2	25	10	40	12	28
Crew 3	15	18	22	32	24
4	29	8	34	10	40
5	35	23	17	26	45

- Q.4 (a) Solve the following 3 X 5 game using dominance property 07

		Player B				
		1	2	3	4	5
Player A	1	2	5	10	7	2
	2	3	3	6	6	4
	3	4	4	8	12	1

- (b) Define: Pay-off, saddle point, strategy, zero sum game, value of game, game and maximin. 07

OR

- Q.4 (a) A company purchases a machine for Rs 10,000. The operation cost for the machine is expected to be more or less the same during its life. The maintenance cost of the machine is Rs 2000 during its first year of the operation. It increases by Rs 800 from second year to fourth year of its operation. During its fifth year of operation, it is Rs 6000 and then onwards, it increases by Rs 1000 every year. The interest rate is 12%. Determine the economic life of the machine. 07

- (b) Explain the various elements of queuing system 07

- Q.5 (a) Explain the following terms in connection with inventory management. (1) Re-order point (2) Safety stock (3) Lead time (4) Economic lot size (5) Carrying cost 07

- (b) What is CPM and PERT. Discuss significance of using CPM and PERT. 07

OR

- Q.5 (a) Explain steps in Monte Carlo simulation process. 07

- (b) What is dynamic programming? Discuss the similarities between dynamic & linear programming. How it differs from linear programming? 07
