Enrollment No: _____ Exam Seat No:_____

C.U.SHAH UNIVERSITY

SummerExamination-2019

Subject Name: Operations Research
Subject Code: 4SC06OPR1 Branch: B.Sc. (Mathematics)
Semester : 6 Date : 02/05/2019 Time : 10:30 To 01:30 Marks: 70

Instructions:
(1) Use of Programmable calculator & any other electronic instrument is prohibited.
(2) Instructions written on main answer book are strictly to be obeyed.
(3) Draw neat diagrams and figures (if necessary) at right places.
(4) Assume suitable data if needed.

Q-1 **Attempt the following questions:** **(14)**

a) Define: Slack variable. 1

b) For maximization problem, what is coefficient of an artificial variable in the objective function? 1

c) Define: Unbounded solution. 1

d) All constraints in an LP problem as well as its objective function must be linear in nature. True or false. 1

e) The right hand side of the constraint in simplex method must be non-negative. True or false 1

f) A linear programing technique improves the quality of _____. 1

g) The _____ points of the convex set give the basic feasible solution to the linear programming. 1

h) If all the constrains are $\geq$ inequalities in a LPP whose objective function is to be maximized then the solution of the problem is unbounded. True or False. 1

i) An optimal solution to the maximized LP problem is reached if all $c_i - z_i \geq 0$. True or False 1

j) MODI stands for 1

(1) Modern distribution (2) Mendel's distribution method
(3) Modified distribution method (4) Model index method

k) Define: Optimum solution 1

l) Define: Degenerate basic feasible solution. 1

m) Define: Saddle Point. 1

n) Define: Fair game. 1

Attempt any four questions from Q-2 to Q-8

Q-2 **Attempt all questions** **(14)**

a) Solve the linear programming problem using simplex method **6**

$Maximize\ Z = 2x_1 + 5x_2 + 7x_3$
Subject to
$3x_1 + 2x_2 + 4x_3 \leq 100$
$x_1 + 4x_2 + 2x_3 \leq 100$
$x_1 + x_2 + x_3 \leq 100$
and $x_1, x_2, x_3 \geq 0$

b) Solve given linear programming problem by Graphically method **5**

$Minimize\ Z = 3x_1 + 2x_2$
Subject to
$5x_1 + x_2 \geq 10$
$x_1 + x_2 \geq 6$
$x_1 + 4x_2 \geq 12$
and $x_1, x_2 \geq 0$

c) Write general mathematical model of LP problem. **3**

Q-3 **Attempt all questions** **(14)**

a) Write down steps of simplex method. **7**

b) Solve the linear programming problem using Big M method. **5**

$Minimize\ Z = 4x_1 + 2x_2$
Subject to $3x_1 + x_2 \geq 27$
$x_1 + x_2 \geq 21$
and $x_1, x_2 \geq 0$

c) Write two limitation of LP problem, **2**

Q-4 **Attempt all questions** **(14)**

a) Explain matrix minima method. Find the initial basic feasible solution of following transportation problem by using matrix minima method. **7**

	D_1	D_2	D_3	D_4	Supply
P_1	2	3	11	6	6
P_2	1	0	6	1	1
P_3	5	8	15	9	10
Demand	7	5	3	2	

b) A company has two plants, each of which produces and supplies two products: A and B. The plants can each work up to 16 hours a day. In plant 1, it takes three hours to prepare and pack 1000 gallons of A and one hours to prepare and pack one quintal of B. In plant 2, it takes two hours to prepare and pack 1000 gallons of A and 1.5 hours to prepare and pack a quintal of B. In plant 1, it costs Rs. 15000 to prepare and pack 1000 gallons of A and Rs. 28000 to prepare and pack a quintal of B, whereas in plant 2 these costs are Rs. 18000 and Rs. 26000 respectively. The company is obliged to produce daily at least 10 thousand gallons of A and 8 quintals of B. Formulate this problem as an LP model to find out as to how the company should organize its production so that the required amount of the two products be obtained at the minimum cost. **7**

Q-5 **Attempt all questions** **(14)**

a) Explain Modified distribution method. **7**

b) Explain difference between CPM and PERT. **7**

Q-6 **Attempt all questions** **(14)**

a) Find optimum solution to the following transportation problem. **7**

	A	B	C	D	Supply
I	5	3	6	4	30

II	3	4	7	8	15
III	9	6	5	8	15
Demand	10	25	18	7	60

b) From the following payoff matrix find the saddle point if it exists. **4**

		Player B			
Player A	Strategy	b_1	b_2	b_3	b_4
	a_1	4	6	8	5
	a_2	-4	11	10	4
	a_3	12	7	10	6
	a_4	6	3	8	-3

c) Define following term **3**

(i) Strategy.

(ii) Competitive game.

Q-7 **Attempt all questions** **(14)**

a) A company sells two different products A and B, making a profit Rs.40 and Rs.30 per unit on them respectively. The production process has a total capacity of 30,000 man hours. It takes 3 hours to produce a unit of A and 1 hour to produce a unit of B. Maximum number of units of A can be sold is 8000 units and that of B is 12,000 units. Subject to these limitations products can be sold in market. Formulate this as a linear programming model to maximize profit. **6**

b) Find all basic solution for the following system of equations **4**

$2x_1 + 6x_2 + 2x_3 + x_4 = 3$

$6x_1 + 4x_2 + 4x_3 + 6x_4 = 2$

c) Draw a network diagram **4**

Activity	A	B	C	D	E	F	G	H	I	J
Predecessor activity	-	A	B	B	B	C	C	F,G	D,E,H	I

Q-8 **Attempt all questions** **(14)**

a) Solve given LP problem by Graphical method **7**

$Maximize\ Z = 4x_1 + 5x_2$

Subject to

$$2x_1 + x_2 \leq 10$$

$x_1 + x_2 \leq 8$

$x_1 \leq 4$

$x_2 \leq 7$

and $x_1, x_2 \geq 0$.

b) Determine initial basic feasible solution to the following transportation problem using **7**

(i) North west Corner method

(ii) Vogel's approximation Method

	Destination					
	I	II	III	IV	V	Supply
A	2	11	10	3	7	4
B	1	4	7	2	1	8
C	3	9	4	8	12	9
Demand	3	3	4	5	6	21