Enrollment No: _____ Exam Seat No:_____

C. U. SHAH UNIVERSITY
Winter Examination-2022

Subject Name: Operations Research

Subject Code: 5SC01OPR1 Branch: M.Sc. (Mathematics)

Semester: I Date: 06/01/2023 Time: 11:00 AM To 2:00 PM Marks:70

Instructions:

(1) Use of Programmable calculator and 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.

SECTION – I			
Q-1		**Attempt the Following questions.**	**(07)**
	a.	Define : Feasible Solution.	01
	b.	Define : Optimal solution.	01
	c.	Define : Basic solution.	01
	d.	Write Down Canonical form of Linear programming Problem.	02
	e.	Write Down Matrix form of LPP.	02
Q-2		**Attempt all questions**	**(14)**
	A	Solve the linear programming problem by using simplex method $\text{Max } Z = 3x_1 + 2x_2$ Subject to $x_1 + x_2 \leq 4$ $x_1 - x_2 \leq 2$ and $x_1, x_2 \geq 0$	06
	B	Solve the linear programming problem by using graphical method $\text{Max} Z = 15x_1 + 10x_2$ Subject to, $4x_1 + 2x_2 \leq 360$ $3x_1 \leq 180$ $5x_2 \leq 200$ And $x_1, x_2 \geq 0$	04
	C	A person requires 10, 12 and 12 units of chemical A, B and C respectively for his garden. A liquid product contains 5, 2 and 1 units of A, B and C respectively, per jar. a dry product contains 1 ,2 and 4 units of A, B, C per carton. If the liquid product is sold for Rs 3 per jar and the dry product is sold for Rs 2 per carton. How many units of each product should be purchased, in order to minimize the cost and meet the requirement.	04
OR			
Q-2		**Attempt all questions**	**(14)**

	A	Solve the linear programming problem by using simplex method $\text{Min } Z = x_1 - 3x_2 + 2x_3$ Subject to $3x_1 - x_2 + 2x_3 \leq 7$ $-2x_1 + 4x_2 \leq 12$ $-4x_1 + 3x_2 + 8x_5 \leq 1$ And $x_1, x_2, x_3 \geq 0$	07
	B	Solve following L P problem using Big-M method $\text{Min} Z = 36x_1 + 10x_2$ Subject to, $3x_1 + x_2 \geq 7$ $2x_1 + 4x_2 \geq 1$ And $x_1, x_2 \geq 0$	07
Q-3		**Attempt all questions**	**(14)**
	A	Solve the following LP Problem by using simplex method. $\text{Max} Z = 3x_1 + 2x_2$ Subject to constraints $4x_1 + 3x_2 \leq 12$ $4x_1 - x_2 \leq 8$ And $x_1, x_2 \geq 0$	07
	B	Solve the following LP Problem by using Two Phase method. Min $Z = x_1 + x_2$ Subject to constraints $2x_1 + x_2 \geq 4$ $x_1 + 7x_2 \geq 7$ And $x_1, x_2 \geq 0$	07
		OR	
Q-3	**A**	Find the Basic feasible solution by LCM method D_1 D_2 D_3 D_4 Supply S_1 11 13 17 14 250 S_2 16 18 14 10 300 S_3 21 24 13 10 400 Demand 200 225 275 250 950	07
	B	Write Down Algorithm of The NWCM method .	07
		SECTION – II	
Q-4		**Attempt the Following questions (1 Mark *7=7)** **(No MCQ Questions)**	**(07)**
	a.	True/False: A feasible solution to a transportation problem is always a basic feasible solution.	01
	b.	True/False: Assignment problem is special case of transportation problem.	01
	c.	Define : Convex set	01
	d.	Write Down Mathematical model of Assignment problem.	02
	e.	Define : Balanced Transportation problem and Unbalanced transportation problem.	02
Q-5		**Attempt all questions**	**(14)**

	A	Find the initial basic feasible solution to the following transportation problem by using the NWCM method. |	D_1	D_2	D_3	D_4	Supply
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S_1	21	16	13	3	11
S_2	17	18	14	23	13
S_3	32	27	18	41	19
Demand	6	10	12	15		 	07
	B	Use the Dual Simplex method to solve the L P Problem Minimize $Z = -3x_1 - 2x_2$ Subject to constraints $x_1 + x_2 - x_3 \geq 5$ $x_1 - 2x_2 + 4x_3 \geq 8$ And $x_1, x_2, x_3 \geq 0$	07
		OR	
Q-5			
	A	Find the Basic feasible solution by LCM method |	D_1	D_2	D_3	D_4	Supply
---	---	---	---	---	---
S_1	19	30	50	10	7
S_2	70	30	40	60	9
S_3	40	8	70	20	18
Demand	5	8	7	14		 	07
	B	Solve the given Transportation problem by using Vogel's approximation method. |	D_1	D_2	D_3	D_4	Supply
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K_1	3	3	4	1	100
K_2	4	2	4	2	125
K_3	1	5	3	1	75
Demand	120	80	73	25	300	 	07
Q-6		**Attempt all questions**	**(14)**
	A	Use the simplex method for solve L P problem Max$Z = x_1 + x_2 + 3x_3$ Subject to constraints $3x_1 + 2x_2 + x_3 \leq 3$ $2x_1 + x_2 + 2x_3 \leq 2$ And $x_1, x_2, x_3 \geq 0$	07
	B	Determine an initial basic feasible solution to the following transportation problem using NWCM method. |	D_1	D_2	D_3	D_4	supply
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O_1	6	1	4	5	14
O_2	8	9	2	7	16
O_3	4	3	6	2	5
Demand	6	10	15	4	35	 	07
		OR	
Q-6		**Attempt all Questions**	

	A	A department of a company has five employees with the five jobs to be performed the time (in hours) that each man takes to perform each job is the given in the effectiveness Matrix How should the jobs be allocated one per employee so as to minimize the total man hours.	07
	B	Find the extremum value of the function $f(x, y) = x^3 + 3x^2 - y^2$.	07

		Employees				
Jobs		I	II	III	IV	V
	A	10	5	13	15	16
	B	3	9	18	13	6
	C	10	7	2	2	2
	D	7	11	9	7	12
	E	7	9	10	4	12