Name: Enrolment No:	

UPES

End Semester Examination, May 2023

Course: System Analysis and Process Optimization **Semester : II**

Program: M. Tech Chemical Engineering **Time : 03 hrs.**

Course Code: CHPD7027 **Max. Marks: 100**

Instructions: 1) Answer the questions section wise in the answer booklet. 2) Assume suitable data wherever necessary. 3) The notations used here have the usual meanings.

SECTION A
(5Qx4M=20Marks)

S. No.		Marks	CO
Q 1	Define a saddle point and indicate its significance.	**04**	**CO1**
Q 2	Differentiate between a slack and a surplus variable.	**04**	**CO1**
Q 3	State the significance of Lagrange multipliers	**04**	**CO1**
Q 4	Write down the standard form of single objective optimization problem.	**04**	**CO1**
Q 5	Define gradient of a function.	**04**	**CO1**
	SECTION B **(4Qx10M= 40 Marks)**		
Q 6	Minimize $f = x_1^2 + (x_2 - 1)^2$ subject to $-2x_1^2 + x_2 = 4$ by Lagrange multiplier method.	**10**	**CO2**
Q 7	Find the minimum of f = x(x − 1.5) in the interval (0.0, 1.0) to within 10% of the exact value using interval halving method.	**10**	**CO2**
Q 8	Perform one iteration using Cauchy's method to minimize $f(x) = 9x_1^2 + 4x_1x_2 + 7x_2^2$ using $X_0 = \begin{Bmatrix}1\\1\end{Bmatrix}$	**10**	**CO3**
Q 9	Discuss the algorithm of secant method. **OR** Discuss about the interior penalty function method.	**10**	**CO4**
	SECTION-C **(2Qx20M=40 Marks)**		
Q 10	Explain the solution algorithm used in NSGA – II optimization technique.	**20**	**CO3**

Q 11	Using a simplex method, Maximize $f = 3x_1 + 2x_2$ Subject to constraints $2x_1 + x_2 \leq 10$; $x_1 + x_2 \leq 8$; $x_1 \leq 4$ and $x_1, x_2 \geq 0$ **<u>OR</u>** Discuss the algorithm of Newton's method for the minimization of multivariable functions. Show that the Newton's method finds the minimum of a quadratic function in one iteration	**20**	**CO4**