Name:

Enrolment No:

UNIVERSITY OF PETROLEUM AND ENERGY STUDIES
End Semester Examination, December 2022

Course: Process Optimization **Semester : V**
Program: B. Tech Chemical Engineering (RP) **Time : 03 hrs.**
Course Code: CHCE3020P **Max. Marks: 100**

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

Section – A (30 Marks)

S. No.		Marks	CO
Q 1	Discuss the concepts of relative and global optima.	**10**	**CO1**
Q 2	Prove that 'the feasible region of a linear programming problem is convex'.	**10**	**CO1**
Q 3	Analyze the difference between a bound point and a free point in the design space.	**10**	**CO1**
	Section – B (30 Marks)		
Q 4	Construct the augmented Lagrangian function for a constrained optimization problem.	**15**	**CO1**
Q 5	Find the solution of the following LP problem graphically: Minimize and Maximize $f = 3x + 9y$ Subject to $x + 3y \leq 60$ $x + y \geq 10$ $x \leq y$ $x \geq 0, y \geq 0$	**15**	**CO2**
	Section – C (40 Marks)		
Q 6	Use the method of least squares to fit the best equation of the type $Nu = aPr^n$ to the data given in Table 1. Table 1: Experimental data on Nu and Pr	**20**	**CO2**

Nu	24.8	60.3	84.5	150	165	193	245	315	380
Pr	0.46	4.2	10	25.3	37	58.5	95	185	340

Q 7	Explain the algorithm of Steepest Descent method to minimize the function. ***OR*** Determine whether the following vectors serve as conjugate directions for minimizing the function $f = 2x_1^2 + 16x_2^2 - 2x_1x_2 - x_1 - 6x_2 - 5$ a) $S_1 = \begin{Bmatrix} 15 \\ -1 \end{Bmatrix}, S_2 = \begin{Bmatrix} 1 \\ 1 \end{Bmatrix}$ b) $S_1 = \begin{Bmatrix} -1 \\ 15 \end{Bmatrix}, S_2 = \begin{Bmatrix} 1 \\ 1 \end{Bmatrix}$	**20**	**CO2**