National Institute of Technology Hamirpur (H. P.)
B. Tech. (Chemical Engineering) – 7th Semester
End Semester Examination 2023-24
CH-430 Optimization of Chemical Process

Duration: 3 hrs.   **Max. Marks: 50**

- This question paper consists of five questions and one page.
- Attempt all questions. Make suitable assumptions, if necessary, by clearly stating them.
- Marks will be deducted for omitting steps.

1	Minimize the function using Lagrange multiplier method $$minimize\ f(x_1,x_2) = 3x_1^2 + 4x_2^2$$ $$subject\ to\ 2x_1 - 3x_2 = 10$$	10
2	$minimize\ f(x_1,x_2) = 6x_1^2 - 3x_1x_2 + 4x_2^2 - 9x_1$ with starting point $X_0 = \begin{Bmatrix} 5 \\ 2 \end{Bmatrix}$ using the Powell's method.	10
3	Consider the minimization of the function using the Simplex method Maximize $Z = 5x_1 + 6x_2$ Subject to $x_1 + x_2 \leq 5;\ 3x_1 + x_2 = 10;\ x_1 + 3x_2 \geq 6;\ x_1, x_2 \geq 0$	10
4	Use the Hooke-Jeeves method to $\min f(x) = -x_1 - 2x_2 + 6x_1^2 - 6x_1x_2 + 2x_2^2$ starting point $X^{(1)} = \begin{Bmatrix} 0 \\ 0 \end{Bmatrix}$. Take $\Delta x_1 = \Delta x_2 = 0.8,\ step\ length\ as\ 0.1\ and\ \varepsilon = 0.1$.	10
5	Use Newton's method to minimize the function $f(x_1,x_2) = x_1 - x_2 + 4x_1^2 + 3x_1x_2 + x_2^2$. With starting point at $X^{(0)} = \begin{Bmatrix} 0 \\ 0 \end{Bmatrix}$.	10