Roll No.:…….

National Institute of Technology, Hamirpur (HP)

Name of the Examination: B.Tech.

Branch	**: EE**	**Semester :07**
Course Name	**:Optimization Methods in Engineering**	**Course Code: EE-431**

Time: 2 Hours **Maximum Marks: 50**

Note : Attempt all the questions.

1 Define design vector and its geometric interpretation. Draw contours of typical constraint surfaces and objective function and then mark various acceptable and unacceptable points and also the optimum point. Prove whether each of the following functions is convex, concave or neither

(i) $f = -2x^2 + 8x + 4$ (ii) $f = x^2 + 10x + 1$ (iii) $f = -x_1^2 + 4x_1x_2$ (12.5)

2 The starting point of the simplex algorithm is always a set of equations, which includes the objective function along with the equality constraints. Express this starting point in mathematical form and then develop the theoretical concepts of the simplex algorithm. Use Simplex method to maximize $Z = 3x_1 + 2x_2$ subject to $-x_1 + 2x_2 \leq 4$; $3x_1 + 2x_2 \leq 14$; $x_1 - x_2 \leq 3$; $x_1 \geq 0,\ x_2 \geq 0$ (12.5)

3 Explain the quadratic interpolation method for minimizing one dimensional function. Also explain the development methodology of Quasi-Newton methods for unconstrained minimization. (12.5)

4 Explain the process of multistage optimization by defining the principle of optimality as stated by Bellman. Discuss the development of backward and forward recursive equations to solve dynamic programming problem. Solve the following problem using an exterior penalty function approach coupled with the calculus method of unconstrained minimization: Minimize $f = x^2 - 10x - 1$ subject to $x - 1 \leq 0$

Show the contours of the ø-function for r_k = 2,4,6 on the graph (12.5)

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