

National Institute of Technology, Hamirpur (HP)

Name of the Examination: M.Tech.

Branch	: EE	Semester :01
Course Name	: Optimization Techniques	Course Code: EE-712

Time: 2 Hours

Maximum Marks: 50

Note : Attempt all the questions.

- 1 Elaborate the classification of optimization problems. Prove whether each of the following functions is convex, concave or neither
 (i) $f = x_1^2 - x_2^2$ (ii) $f = x^2 + 10x + 1$ (iii) $f = -x_1^2 + 4x_1x_2 + 4x_2^2$

- 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 Discuss the mathematical development elimination methods for one dimensional minimization. Explain the quadratic interpolation method for minimizing one dimensional function. (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 interior 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 ϕ -function for $r_k = 6, 4, 2$ on the graph (12.5)
