

AEM 685: Homework # 3

Due on 09/21/2015

Important: Please work independently.

Problem 1: Minimize the Rosenbrock problem using steepest gradient method

$$\text{Minimize } f(x_1, x_2) = 100(x_2 - x_1^2)^2 + 100(1 - x_1)^2$$

$$\text{Sub to: } -5 \leq x_1 \leq 5$$

$$-5 \leq x_2 \leq 5$$

Start the optimization using $x_1 = 0$ and $x_2 = 0$ as an initial guess for design variables.

(30 points)

Problem 2: Solve *Problem 1* using conjugate gradient method.

(30 points)

Problem 3: Solve *Problem 1* using BFGS method.

(40 points)

Note: For all three problems, you have to plot the optimization history in the contour plot. Define convergence criteria for optimization using change in objective, change in design variables and constraint on the gradients. Compare the number of iterations required for the convergence along with design variables and function value. Remember that you have to utilize bounds and Golden section method for obtaining step length, α . You might have to modify the programs developed in Homework#2 to work on multidimensional problem. True solution for this problem is: $x_1 = 1$, $x_2 = 1$, and $f(x_1, x_2) = 0$.