Homework # 5 (Due April 12-Saturday, 2008)

* Solve the following problems by programming the steepest descent method and the conjugate gradient method. Use the Golden-section method for the one-dimensional search. Attach your Matlab codes.

1. Use your Matlab codes for the steepest descent method and the conjugate gradient method to solve the following problems. Comment on your result from physical point of view.

   a) Solve the following problems [This is the same as Belegundu's example 3. 12]:

   i) Rosenbrok's function (the minimum is in a parabolic valley):

   $$f = 100(x_2 - x_1^2)^2 + (1 - x_1)^2$$
   $$\mathbf{x}_0 = (-1.2, 1)^T$$

   ii) Wood's function (this problem has several local minima):

   $$f = 100(x_2 - x_1^2)^2 + 5(1 - x_1)^2 + 90(x_4 - x_3^2)^2 + (1 - x_3)^2 + 10.1[(x_2 - 1)^2 + (x_4 - 1)^2] + 19.8(x_2 - 1)(x_4 - 1)$$
   $$\mathbf{x}_0 = (-3, -1, -3, -1)^T$$

   (I.e., find. x^*, f^*, NG, NF)

   b) Plot the iteration history of your function.

   c) Show how your solution approaches the exact solution on the contour plot depending on your method. (Consider example 3.12 i) only).

2. Consider Example 3.1 of Belegundu's book with $k_1 = k_2 = 1$ lb/in and $F_1 = 0$. Determine the vertical displacement Q_2 for $F_2 = 2.5, 3, 6$, and 10. Plot Q_2 (vertical axis) versus F_2. [Belegundu's book, Problem 3.8]