AEM 685: Midterm # 2

Due on 11/05/2015

Important: Please work independently. You are allowed to use Matlab, Maple, Mathematica, your notes and books.

Problem 1: Minimize the following problem using Genetic algorithm (GA) method.

$$Minimize\ f(x_1, x_2) = 3 * \sin(0.5 + 0.25x_1x_2) * \cos(x_1)$$

$$\text{Sub to: } 0 \le x_1 \le 5$$

$$0 \le x_2 \le 8$$

Use the population size equal to two and utilize binary coding for the design variables. Carry out two iterations of GA using rank based algorithm. You have to show your handwork for two iterations not the program. (30 points)

Problem 2: For the optimization problem,

$$Minmize \quad f(x_1, x_2) = -x_1x_2$$

$$Subject\ to \quad g(x_1, x_2) = \frac{x_1^2}{9} + \frac{x_2^2}{4} - 1 \le 0$$

$$0 \le x_1 \le 3$$

$$0 \le x_2 \le 2$$

Use two iterations of 'Method of Feasible Directions' (page 201 of Vanderplaats) and in Eq. (6.30), $|S| \le 1$; θ_j=1. The initial design vector is *[1, 1]*. Show the calculation (handwork) for two iterations (not the program) (35 points)

Problem 3: Solve the optimization problem defined in **Problem 2** using 'Extended Interior Penalty Function Method', but you have to use 'Quadratic Extended Penalty' approach. We have discussed about this approach in the notes. Start the optimization from the initial design *[2.5, 1.6]*. Show two iterations (handwork) of the optimization.

(35 points)