**EGR 7040 *Design Optimization***

**Wright State University, Autumn 2015**

**Homework # 8 – Due electronically**

Solve the following problems in your own words and to the best of your ability:

7.1 (3.34) 7.5 (3.51) 7.8 (3.54)

1. Solve the following constrained optimization problem using MATLAB. Use the following as your starting points: (a) [1; 1] and (b) [1; 6]

Find {*x*1, *x*2} to minimize

Subject to:

Answer the following questions:

1. Solve the above problem using MATLAB. Report the optimum value of *x*1 and *x*2, and the corresponding minimum value of *f*(***x***) for both starting points.
2. Does the minimum objective function value change when the starting point is changed?
3. What is the effect of the starting point on the optimum value of *x*2?
4. Explain in your own words any interesting features of this problem in view of the above questions.
5. Consider the following problem:

Find {*x*1, *x*2} to minimize

Subject to:

1. Solve the above problem using MATLAB. Report the optimum value of *x*1 and *x*2, and the corresponding minimum value of *f*(***x***).
2. Solve the above problem by removing the first constraint 2*x*1 + *x*2 > 4. Report the optimum value of *x*1 and *x*2, and the corresponding minimum value of *f*(***x***).
3. Now, solve the same problem by removing all the constraints. Report the optimum value of *x*1 and *x*2, and the corresponding minimum value of *f*(***x***).
4. Create a contour plot showing the contours of the objective function. Show on it the locations of the optima obtained in Parts (a) – (c).
5. The following is a linear programming problem.

Find {*x*1, *x*2} to minimize

Subject to:

1. Solve the above linear optimization problem using the linprog command in MATLAB.
2. Solve the above problem using the fmincon command in MATLAB. Compare the results with the results obtained in (a).

**Format:**

* Typed (nothing handwritten), short paragraph for each question. Must include original problem statement, step-by-step description and graphical solution
* Concise, clear, and complete; in your own words (don’t copy from the text)
* Find other source material to develop your understanding of the concepts and ideas (online or other books); include as “References”
* Submit electronically via WSU’s “WINGS” on-line class web-site (MS Word or PDF or other readable file format)
* Due date: Sunday 8 November 2015 by 11:55PM

*Show intermediate steps and be concise, clear, and complete.*

**Upon completion of Chapter and this homework sequence, you will be able to**

* Use the capabilities of the Optimization Toolbox in MATLAB to solve both unconstrained & constrained optimization problems

**References:**

Arora, Jasbir. *Introduction to Optimum Design, 3rd Edition*. Academic Press, 08/2011

Messac, Achille. *Optimization in Practice with MATLAB*. Cambridge University Press, 2015.