AE6310: Optimization for the Design of Engineered Systems
Quiz 4: Take home quiz

Briefly answer the following questions on the paper provided. Organize your work and be careful to properly answer all parts of each question.

1. (10 points) Describe the key difference between distributed (or hierarchical) MDO architectures and monolithic architectures. Name an example of a distributed architecture and a monolithic architecture.

2. (10 points) Describe the differences between the MDF and IDF archiectures. Illustrate the difference between these architectures using a diagram and key equations.

3. (30 points) You are given sample data from a 1-dimensional black box function with values shown below. Find a surrogate model $\hat{f}(x)$ using the basis function $\phi_1(x) = 1$ and $\phi_2(x) = x$ with the following data:

x_i	$f(x_i)$
0	0
1	0.5
2	2
3	4.5

4. (30 points) You are given sample data from a 1-dimension black box function with values shown below. Find the RBF interpolant $\hat{f}(x)$ using the multiquadratic function $\phi(r) = \sqrt{r^2 + r_0^2}$, where $r_0 = 2$, with the following data:

x_i	$f(x_i)$
1	1
3	$\sqrt{2}$

5. (10 points) What is the Hamming Cliff and why is Gray Code a better encoding technique for genetic algorithms?

6. (10 points) Why are mutation and randomness key elements of Genetic Algorithms and Particle Swarm Optimization, respectively?