Department of Aerospace Engineering
IIST, Thiruvananthapuram

Multi-disciplinary Optimisation
(AE 496)

9:00-10:00AM
11/10/2017
(D4)

Maximum Marks: 15

Note:

1. All questions are compulsory.
2. Clearly state all the assumptions/approximations in the derivations/answers.

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1. With an example, illustrate the uniform crossover operator and the mutation operator in genetic programming.

[3]

2. Explain the particle swarm algorithm with the help of a flowchart or a pseudocode.

[4]

3. $$\text{Minimise} \quad f_1(x,y) = x^3 + y^2, \quad f_2(x,y) = 5(y^2 - x)$$

   Using the weighted l_2 distance metric, find the pareto-optimal solutions corresponding to the following weight vectors:

   1. $(w_1, w_2) = (1, 0)$
   2. $(w_1, w_2) = (0.5, 0.5)$
   3. $(w_1, w_2) = (0, 1)$

   Draw a sketch of the objective space and discuss if all Pareto-optimal solutions can be found by the weighted l_2 distance metric method.

[4]

4. $$\text{Minimise} \quad f_1(x,y) = x^3 + y^2, \;\; f_2(x,y) = y^2 - 4x$$

   1. Using the weight vector $\mathbf{w} = (w, 1-w)^T$, find the Pareto-optimal solutions in terms of w.
   2. What is the relationship between f_1 and f_2 for the Pareto-optimal solutions?
   3. What is the Pareto-optimal solution corresponds to $w = 0.5$?
   4. Show that the weighted-sum approach will not find half of the Pareto-optimal front.

[4]

Student's name: End of exam