King Mongkut's University of Technology Thonburi
Final Examination of First Semester, Academic Year 2014
↑ Special Topical IV :
COURSE CPE 354 Optimization Design & Evolutionary Computing **Computer Engineering Department**
Monday 1 December 2014 **13.00-16.00h.**

Instructions

1. This examination contains 7 main problems, 5 pages (including this cover page).
2. The answers must be written in these examination sheets.
3. Students are allowed to use calculators.
4. **This examination is closed books/notes, with 1 sheet of A4 exception. (สามารถนำกระดาษ A4 เข้าได้ 1 แผ่น) The sheet has to be submitted together with the final exam (ส่งกระดาษพร้อมกับข้อสอบ)**

Students must raise their hand to inform to the proctor upon their completion of the examination, to ask for permission to leave the examination room.
Students must not take the examination and the answers out of the examination room.

Students will be punished if they violate any examination rules. The highest punishment is dismissal.

This examination is designed by

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Tel. 0-2470-9089

This final examination is approved by the computer engineering department.

Student Name _____ Student ID _____

Problem	Scores	Obtained Scores
1	5	
2	5	
3	10	
4	5	
5	8	
6	12	
7	15	
Total	**60**	

Student Name _____ Student ID_____

1. What are the main goals in finding solutions for multi-objective evolutionary algorithms (MOEAs)?

2. Describe a technique to prune Pareto-optimal solutions with user preference. Why do we want to prune the solutions?

3. Network Reliability analysis:

   Given: number of nodes in the network is 5. Each network link has reliability = 0.98. Network node is assumed to be perfect.

   Find the reliability of the network with tree topology.

   Find the reliability of the network with ring topology.

   Find the maximum reliability of the network with multi-ring topology (with 3 sub rings including the main ring).

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4. Where is uncertainty in reliability modeling and optimization? Discuss the system reliability optimization results with different assumptions that are risk-averse, risk-neutral and risk-seeking assumptions.

5. How to handle a problem when we want to maximize function $f_1(x1, x2)$, while minimizing function $f_2(x1, x2)$? Explain two different ways to consider the 2-objective optimization problem. What are the trade-off solutions?

6. Suppose that there are 8 obtained solutions from an optimization problem as shown in the table.

Solution	Reliability, E(R(x))	Variance, Var(R(x))	Cost
A	0.95	0.3	82
B	0.95	0.25	80
C	0.93	0.22	82
D	0.92	0.25	80
E	0.92	0.21	75
F	0.90	0.17	71
G	0.90	0.22	68
H	0.88	0.18	65

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6.1) Which solutions are the Pareto optimal solutions when we consider maximizing system reliability, minimizing system variance and minimizing system cost? Explain.

6.2) Find Pareto-optimal solutions that minimize system variance, Var(R(x)), while minimizing the system cost. Explain. (5 points)

6.3) Find Pareto-optimal solutions that maximize system reliability estimate while minimizing its variance. Explain. (5points)

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7. Describe your term project's problem and how you solve it with an evolutionary algorithm. Discuss the problem size and the parameter settings in your algorithm. What was the most difficult part in solving the problem? How did you verify your results if they are optimal or near optimal?