



King Mongkut's University of Technology Thonburi

Seat No. \_\_\_\_\_

Computer Engineering Department

Final Exam Semester 2/2557

**Course:** CPE 333 Software Engineering

**Program:** Computer Engineering, 3<sup>rd</sup> Yr.

**Date:** Thursday 14<sup>th</sup> May 2015

**Time:** 9:00 – 12:00

**Name:** \_\_\_\_\_

**ID:** \_\_\_\_\_

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**Instructions:**

1. Permitted:
    - a. This is an open book exam. Students may bring any book or notes they wish to the examination room.
    - b. One calculator that has no communications capability.
  2. There are 9 problems in 7 pages including this instruction sheet. The total score is 100 points.
  3. Please write all your answers in this examination document.
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This examination is designed by

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**Part I: Software Testing (20 points)**

1. [5 points] What is the difference between static (Analysis) and dynamic (Experimentation) validation approach and example of verification method?

2. [5 points] Suppose that each procedure in my program has a specification. I wish to prove the whole program is correct; that is, each procedure satisfies its specification.

If the program has no recursion, it is easy to reason modularly — that is, one procedure at a time. Here is how you could do that.

(a) First, prove correctness of each procedure at the leaves of the procedure call tree (the ones that call no other procedure).

(b) Next, prove correctness of the procedures that call only the leaf procedures. During this process, it is valid to rely on the specifications of the leaf procedures, and assume that each leaf procedure call does exactly what its specification says.

(c) Now, continue up the procedure call tree.

Now, suppose that the program contains recursion. When reasoning about a procedure call (including a self-call) it would be circular reasoning to assume that the procedure is correct if I have not already proved it — that is, to assume that the procedure is correct in order to prove it correct.

What approach do you suggest in this circumstance? Explain why it works and any potential downside.

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3. [5 points] Using the pseudo-code function to draw the flow graph, and write down all test cases and expected result from the function to cover all possible path?

```
1      int someFunction( int a, int b ){  
2          int result = 0;  
3          if ( a < b ) {  
4              System.exit( 0 );  
5          }  
6          else {  
7              int c = a + b;  
8              int i = 0;  
9              while ( i < c ){  
10                 result = ( result + a )/ b;  
11                 i++;  
12             }  
13         }  
14         return result;  
15     }
```

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4. *[5 points]* Provide short answer for each of the following questions.

4.1 What is the meaning of “Responsive Design”? Why is it important?

4.2 Suggest a method to test software usability. Briefly explain your method.

4.3 Suggest a list of rules for a good User Interface design.

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5. [10 points] Describe “elaboration” and “refactoring” techniques used in a component-level design process.

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6. [10 points] Explain the Model-View-Controller (MVC) concepts and some of its benefits. What are the M, V, and C in a web application context?

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7. [10 points] What is an "observer" behavioral design pattern for object-oriented design? Describe how it may be used.

### Part III: Software Configuration Management (50 points)

8. [20 points] Consider a project with the following tasks, duration, predecessors, and resource assignments. Assume the project starts Wednesday 1 April 2015. In addition to Saturdays and Sundays, April 6<sup>th</sup> is Chakri holiday, April 13-15 are Songkran holidays, May 1, 4, and 5 are also holidays. Employee Pu will be on summer holiday leave for April 16-17. Assume each workday of this company has 8 hours from 10:00 to 13:00, then from 14:00 to 18:00. Also, employee Kung goes to night college daily, so she only works 6 hours a day, leaving work by 16:00 every work day.

April 2015								#	Tasks	Duration	Predecessor Tasks	Priority	Resource
Mo	Tu	We	Th	Fr	Sa	Su		1	A	5 days		500	Pu
30	31	1	2	3	4	5		2	B	16 hours	1	800	Kung
6	7	8	9	10	11	12		3	C	30 hours	2, 4	500	Kung
13	14	15	16	17	18	19		4	D	4 days		700	Kung
20	21	22	23	24	25	26		5	E	12 hours		300	Pu
27	28	29	30	1	2	3		6	F	5 days		900	Kung
4	5	6	7	8	9	10		7	G	20 hours		500	Pu
								8	H	10 hours	3	500	Kung
								9	I	5 days	6	800	Pu

For resource leveling, assume tasks are assigned ordered by Priority (high to low) first and then by item number ("#" – low to high). If possible, no resource should be free. Show the Resource Usage Sheets for each employee Pu and Kung in the table below by entering hours worked each day:

Hours Assigned per date for Pu (mark holidays as shaded area):

#	Task	Hours	A P R I L 2 0 1 5															M A Y 2 0 1 5												
			1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28

Hours Assigned per date for Kung (mark holidays as shaded area):

#	Task	Hours	A P R I L 2 0 1 5															M A Y 2 0 1 5												
			1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28

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9. Based on the data below from past projects at GeneralSoft Company using C++ language:

Project Name	KLOC	Effort (p-months)	Cost in Baht	Errors	Defects
Payroll Processing	30	10	1,500,000	100	20
Call Center Management	120	40	4,500,000	300	10
Logistics Management	80	30	3,000,000	200	20
GPS System for Logistics	20	10	1,000,000	100	10

Programming LOC per FP Conversion Table:

Programming Language	Average LOC per FP
Ada	150
C	160
C++	70
COBOL	80
Java	60
Perl	60
Visual Basic (VB)	50

9.1 [5 points] What is the Cost Per LOC for this company? Show your work.

9.2 [5 points] If a new C++ Project has FP of 200, what would be its expected cost? Show your work.

9.3 [5 points] What would be this company's Defect Removal Efficiency?  $DRE = \frac{E}{E + D}$

9.4 [5 points] Find errors per person-day, assuming 22 person-days in one person-month

9.5 [10 points] The overall Risk Exposure, E, is determined using the following relationship:  $E = P \times C$  where P is the probability of occurrence for a risk, and C is the cost to the project should the risk occur. Consider a new C++ project with 20 KLOC that has Risks: R1, R2, R3, and R4, each with probability of 10%, 20%, 30%, and 40%, respectively and cost if risk occurs of 500,000 baht, 300,000 baht, 200,000 baht, and 100,000 baht, respectively. If you charge based on 10,000 baht per person-day, what should your total price (price plus risk exposure cost) for this project be after adding in the risk exposure cost? Show your work.