THE HONG KONG POLYTECHNIC UNIVERSITY

DEPARTMENT OF COMPUTING

EXAMINATION

Course : MSc Scheme - 61030

Subject : COMP5222 Software Testing And Quality Assurance

Group : 101, 102, 103, 104, 1888

Session : 2010 / 2011 Semester I

Date : 23 December 2010 Time : 18:30-20:30

Time Allowed: 2 Hours Subject Lecturer: Lui Wing Cheung Richard

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This question paper has 15 pages (cover included).

Instructions to Candidates:

Answer all questions in the space provided.

Do not turn this page until you are told to do so!

Name:

Student ID:

Mark:

Question 1 (15 marks)

a) [5 marks] List the difference phases of a formal code inspection process.

b) [4 marks] Explain whether requirement reviews are validation/verification activities.

c) [6 marks] Explain why the following statements is false.

"Dynamics testing is a preventive measure for quality assurance. It involves the automated testing for the validation of software."

Question 2 (20 marks)

a) [6 marks] Consider the following definition of the defect density for a program.

$$Defect\ density = \frac{Total\ number\ of\ defects\ introduced\ in\ the\ software\ development\ process}{size\ of\ software}$$

i) How can we determine the total number of defects introduced and the size of software?

ii) Explain whether the statement "Higher defect density implies bad software quality" is true/false.

b) [14 marks] Consider the following table which cross-tabulates by where defects are found and defect origin in a software development process.

		Defect Origin							
Where found		Requirement	High-level design	Low-level design	Coding	Unit Testing	Integration testing	System Testing	Production
	High-level design review	49	681						
	Low-level design review	6	42	681					
	Code Review	12	28	114	941				
	Unit testing	21	43	43	223	2			
	Integration testing	20	41	61	261	0	4		
	System Testing	6	8	24	72	0	0	1	
	Production	8	16	16	40	0	0		1

Let S be the number of defect removed by subsequent phases and L be the number of defects introduced in subsequent phases.

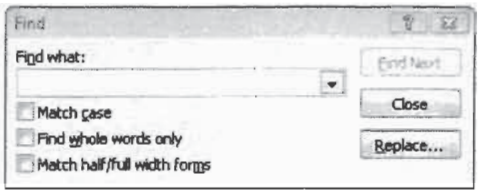
i) What are the values of S, L, and the DRE for the following software development phases?

	S	L	DRE
High-level design review			
Low-level design review			
Code Review			
Unit testing			

ii) Based on the DRE, suggest three possible ways to improve the test process.

Question 3: (20 Marks)

a) [8 marks] Consider the text field "Find What" (which allows the users to type string to search in a document) in the "Find" function in Windows notepad.



i) Discuss the need for using EC testing for the input variable.

ii) State 4 different conditions/characteristics for partitioning the input variable.

b) [12 marks] NextDate is a function of three variables: month, day, and year, which returns the date of the day after the input date. There are 29 days in Feb in leap years and only 28 days in common years.

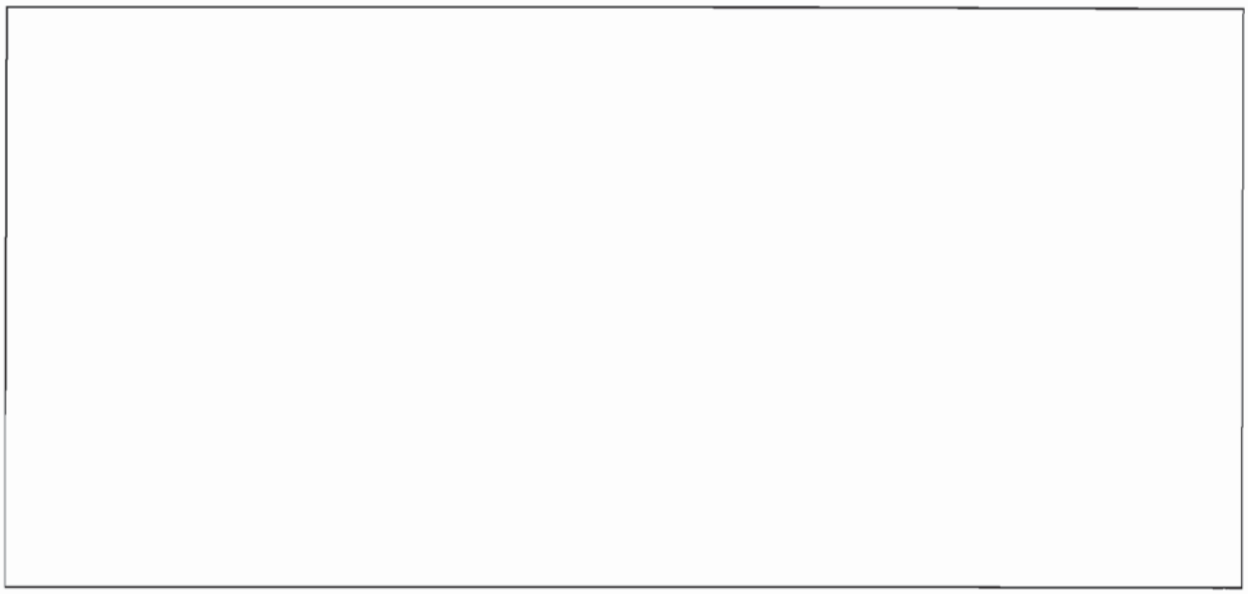
Consider the following valid equivalence classes for the function.

- M1= {month | month has 30 days}
- M2= {month | month has 31}
- M3= {month | month is February}
- D1= {day | $1 \leq$ day <= 27}
- D2= {day | day = 28}
- D3= {day | day = 29}
- D4= {day | day = 30}
- D5= {day | day=31}
- Y1= {year | year is a leap year}
- Y2= {year | year is a common year}

i) What is the number of test cases required for performing strong and weak EC testing?

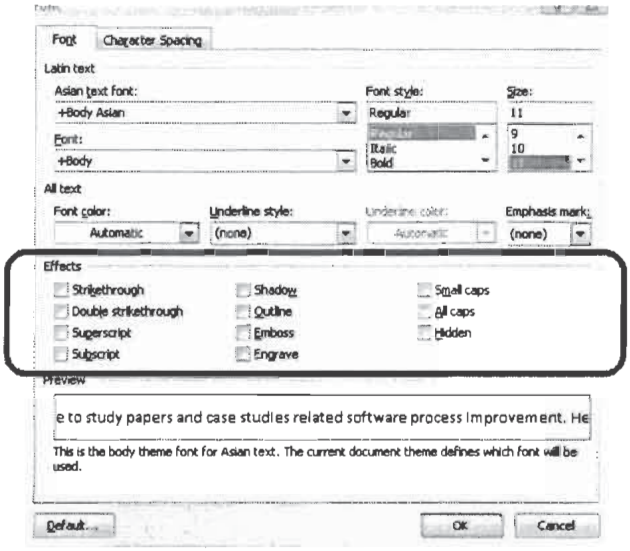
ii) Consider the ECs for the variable month. Explain how you may refine the ECs.

iii) Refine the set of ECs based on the following requirements: A year is a leap year if it is divisible by 4 unless it is a century year. Century years are leap years only if they are multiples of 400. For example, 1600 and 2000 were leap years, but 1700, 1800 and 1900 were not.



Question 4 (10 marks)

Consider the effects options in the font dialog in Microsoft Word.



a) [2 marks] What is the number of test cases required for testing all combinations?

b) [4 marks] Consider the use of pairwise testing for testing the combinations.

i) Define the factors and levels.

ii) What is the number of pairs of values to be covered in pairwise testing?

c) [4 marks] With the use of an example of 3-way fault, discuss whether the pairwise testing can detect the fault.

Question 5 (20 marks)

a) [10 marks] Consider the following requirement: A student fails in a course if his quiz mark<30 or exam mark<50.

Suppose the (faulty) implementation is shown as follows.

```
int quiz, exam;
input(quiz,exam);
boolean result;
if (quiz<30)
       result = "failed";
else
       result =  "pass";
if (exam>=50)
       result = "pass";
else
       result = "failed";
output (result);
```

i) What is the minimum number of test cases required for achieving the following types of coverage?

	Minimum number of test cases
Statement coverage	
Decision coverage	
Multiple condition coverage	
Path coverage	

ii) Explain whether the following the following types of test set can always detect the fault?

- Decision coverage adequate test set
- Path coverage adequate test set

b) [6 marks] Explain whether the following statement is true/false.

"Multiple condition coverage subsumes path coverage."

c) [4 marks] Consider the use of mutation testing to test the following Java function for classifying the type of a triangle.

```
public static void testTriangle(int a, int b, int c){
        if(a<b+c && b<a+c && c<a+b){
                if(a==b && b==c)
                        System.out.println("Equilateral");
                else if (a==b || b==c || a==c)
                        System.out.println("Isosceles");
                else if (a!=b && b!=c)
                        System.out.println("Scalene");
        }
        else{
                System.out.println("Not a triangle");
        }
}
```

Consider the 6 relational operators: ==, !=, >, >=, <, <= and the 3 logical operators: or (||), and (&&), not (!).

i) How many mutants are generated if we apply relational operator replacement (ROR)?

ii) How many mutants are generated if we apply logical connector replacement (LCR)?

Question 6 (15 marks)

a) [4 marks] Describe, with the use of an example, the purpose of a browser test matrix.

b) [2 marks] Describe the two different ways in which content testing can be performed in web testing.

c) [3 marks] Describe three ways in which navigation testing can be performed for web applications.

d) [6 marks] With the use of diagram, contrast the different types of stress tests.

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