THE OPEN UNIVERSITY OF SRI LANKA
BACHELOR OF SOFTWARE ENGINEERING – LEVEL 05
DEPARTMENT OF ELECTRICAL AND COMPUTER ENGINEERING
ECI 5267 – SOFTWARE TESTING AND QUALITY ASSURANCE

FINAL EXAMINATION – 2014 / 2015

Date: 9th, August 2015 **Time: 0930-1230 hrs**

<INSTRUCTIONS>

1. Answer **Question 1** in **Part A**, which is compulsory.
2. Answer **3 questions out of 5** given in **Part B.**
3. This is a closed book exam and no reference books and materials are allowed.

PART A (Compulsory question)

Read the given scenario and answer the questions.

Data Center Temperature Control System

The Data Center Temperature Control (DCTC) system is required to maintain the server room temperature within the optimum range of 20°C – 24°C. It consists of a micro-processor based environment control system that monitor temperature and controls the air conditioner (AC). The micro-processor operates in discrete cycles.

The temperature sensor monitors ambient temperature continuously. At the start of each cycle, its signal is digitised and stored in register T within the micro-processor, as a floating point number representing temperature in °C.
The fan switch operates in response to the value 0 (off) or 1 (on) being set in output register F at the end of cycle.

Any exception condition must result in the alarm register Z being set, and no other action being taken.
The behaviour of the DCTC system depends on the software in the micro-processor.

Part of the Functionality expected:

- *On each cycle the program read the temperature from T*
- *It does a range check on T: if T is less than 10 °C , or greater than 30 °C then the AC is assumed to be malfunctioning and the alarm register Z is set to 1.*
- *The fan switch F must be set to 1 (fan on) if the temperature is above 30 °C and to 0 (fan off) if it below 24°C, otherwise F must be unchanged.*

(You may make realistic assumptions when answering this question, but all assumptions needs to be clearly stated in the document)

Question 1

a) You are assigned to test the system using black box approach, selecting test cases based on functional specification. The input for this program is defined by the possible values of T. Partition input space into a set of equivalent classesto achieve a reasonable coverage.

(10 marks)

b) Write one test case completely with *Test Case no, Type (UI/Fun), Prerequisites, Description, Steps ar details, Test Data, Expected Output, Execution Status* etc. (5 marks

c) Draw a flow graph for the above scenario. (10 marks)

d) If you were to adopt a white-box approach, you would select test cases in order to cover th program code instead of input space.

Would the test cases defined in (a) above achieve complete coverage of all paths of th code? Briefly give your reasons or provide additional test cases to cover any paths whic have been missed. (4 marks

e) In normal operation, we expect to change gradually from one cycle to next, since the serve room temperature will warm up and cool down slowly in comparison to the microprocesso cycle time, Suppose the software were enhanced to detect additional exception condition "if T differs from its value on the previous cycle more than 4 □C which might also indicat a malfunctioning AC.

i. Draw the additional part that is needed in the flow graph. (5 marks
ii. How would this affect the input space and hence the selection of black box tes cases? (4 marks
iii. Would be possible to achieve complete path coverage for the entire program? (2 marks

Question 2

Sri Lanka Chemicals is an industrial chemical factory,running potentially dangerous process. Th management of this factory has outsourced some process control software to a small softwar development company. When delivering the software, the salesperson says: "We have exhaustivel tested this software using both black box and white-box methods. The bugs that were found wer removed so we are quite certain that the software will not fail in operation".

a) As the IT consultant of the factory, would you believe that the software had bee 'exhaustively' tested under either of the testing methods? Briefly state your reasons. (5 marks)
b) Would you accept that the software is certain not to fail? Justify your answer. (5 marks)
c) In this situation what would you insist that the software developing company should do t validate these claims, before accepting the delivery. (3 marks)
d) Briefly describe what non-functional testing is and list 3 non-functional test types. (7 marks

Question 3

a) What is the difference between quality assurance and quality control? (2 marks)
b) What is meant by Test Metrics in quality assurance? (2 marks)
c) Briefly explain 4 Metrics that are used in order to validate the software Quality. Tabularize your answer under the headings, *name of the test metric, definition, purpose and how to calculate.* (16 marks)

Question 4

a) Quality models are designed for a specific purposes. What is the purpose of CMM? (3 marks)

b) How will a quality model help to identify the effectiveness and efficiency of a new business process introduced to the organization? (3 marks)

c) Draw a concept map to explain the relevance of ISO 9000 family of standards for software quality assurance. (10 marks)

d) What are the benefits of root cause analysis in quality engineering? (4 marks)

Question 5

a) Illustrate the Cost of Software Quality (CoSQ) model and describe rationale of the model. (6 marks)

b) Differentiate among fault prevention, fault tolerance and fault detection **strategies**. (6 marks)

c) What is expected by software validation? (5 marks)

d) Briefly describe 3 of the key documentation that are used in validation techniques. (3 marks)

Question 6

a) Define equivalence class partitioning & boundary value analysisin black box testing. (4 marks)

b) Read the following module description and answer the questions: *This module is web page collecting donations for flood victims in Bangladesh. It allows entry of a contribution from Rs. 100 to Rs. 999,999.99.* (12 marks)

i) *For each test case generated by equivalence class partitioning, specify the equivalence classes covered, input values, and expected outputs.*
ii) *For each test case generated by boundary values analysis, specify the boundary values covered, input values, and expected outputs*

c) *"When there are 2 separate teams in a project for development and testing tasks, the quality of the product will increase."*

Do you agree with the above statement? Justify for your answer. (4 marks)