UNIVERSITY OF LONDON

CM2010

BSc EXAMINATION

COMPUTER SCIENCE

Software Design and Development

Release date: Tuesday 19 September 2023 at 12:00 midday British Summer Time

Close date: Wednesday 20 September 2023 by 12:00 midday British Summer Time

Time allowed: 4 hours to submit

INSTRUCTIONS TO CANDIDATES:

Part A of this assessment consists of a set of **TEN** Multiple Choice Questions (MCQs). You should attempt to answer **ALL** the questions in **Part A.** The maximum mark for Part A is **40**.

Candidates must answer **TWO** out of the **THREE** questions in **Part B**. The maximum mark for Part B is **60**.

Part A and Part B will be completed online together on the Inspera exam platform. You may choose to access either part first upon entering the test area but must complete both parts within **4 hours** of doing so.

Calculators are **not** permitted in this examination. Credit will only be given if all workings are shown.

Do not write your name anywhere in your answers.

PART A

Candidates should answer the **TEN** Multiple Choice Questions (MCQs) in Part A of the test area.

PART B

Candidates should answer any **TWO** questions from Part B.

Question 1

Assume a group of students in UoL wants to design a website to sell and buy their second hand stuff. In this question, you will be considering the development of such a website.

(a) Describe the process of test-driven development. What are the three laws?

[4 marks]

(b) You are given the following requirement for the website described above:
"Users can add item to their shopping list"
Write out a step-by-step process to test this requirement.

[4 marks]

(c) For the website described above, we want to ask some users to answer a questionnaire for usability testing. Design two questions to cover effectiveness, two questions to cover efficiency and two questions to cover satisfaction.

[6 marks]

(d) Consider the development of a Virtual Learning Environment (VLE) through which students manage their studies. They can watch videos, attend online webinars, access forums etc. The VLE platform has the following features available to different user roles: user can edit course quiz (admin user), user can report content issues (University of London student user and admin user), user can view course advert video (any logged-in VLE user). Write out a matrix test plan to cover the THREE features and the THREE user types.

[6 marks]

(e) Write TWO requirements for the website described above using the EARS syntax.

[4 marks]

(f) For each of the following write out a very simple example code fragment (in JS, Python or C/C++) that illustrates it with clear comments in the code to explain why it illustrates that item.

i. Pathological module coupling

[3 marks]

ii. Communicational module cohesion

[3 marks]

Question 2

You are part of a team writing a system which keeps track of parcels in a delivery company. The process begins when a person gives the parcel to the delivery company, at which point a barcode (containing all necessary information) is generated, and the parcel is labelled. Then, it is possible to keep track of the parcel between different places. The software has the following functions:

i. generateBarcode()
ii. createDatabaseRecord()
iii. updateDatabaseRecord()
iv. decodeBarcodeAndUpdateParcelPosition()
v. getParcelPosition()

(a) Define module coupling and module cohesion.

[4 marks]

(b) State and describe TWO types of beneficial module couplings that may be present in this piece of software.

[4 marks]

(c) For each function, pick an example of possible module cohesion and explain the type of that module cohesion.

[5 marks]

(d) You have been editing the code on a branch you have created on the Git repository for the function getParcelPosition(). In the meantime, somebody else has been editing the same piece of code. Specifying the Git commands used, describe the process of merging your branch back into the master branch.

[5 marks]

(e) Assume that the GUI for the software is written in Python. You are tasked with using bandit to perform a static analysis on this code.

a. Describe the steps to install bandit and analyse a piece of code.

[2 marks]

b. Give THREE examples of security flaws that bandit can find.

[6 marks]

(f) We know that function updateDatabaseRecord() alters the actions of function createDatabaseRecord(). State and describe the type of module coupling that exists in the code containing these two functions.

[4 marks]

Question 3

(a) Name THREE specific techniques that can be used to make programs more robust.
[3 marks]

(b) For each one of the techniques you named in (a), write a code fragment (in JS, Python or C/C++) and an explanation of how it works.
[9 marks]

(c) Name and state the purpose of THREE git commands.
[3 marks]

(d) The following function, written in Python, takes a file name as input and then shows the contents of the file on the screen. Explain why it is not a robust program? Propose TWO different mechanism to make it robust.
[3 marks]

```
def print_file(FileName):

      f = open(FileName, "r")
      print(f.read())
```

(e) Referring to the Three Laws according to Uncle Bob, and a unit testing framework you have studied in this course. Describe the workflow of Unit Testing.
[9 marks]

(f) Define White box and Black box Testing and explain the difference between them.
[3 marks]

END OF PAPER