UNIVERSITY OF LONDON

CM2010

BSc EXAMINATION

COMPUTER SCIENCE

Software Design and Development

Release date: Monday 12 September 2022 at 12:00 midday British Summer Time

Submission date: Tuesday 13 September 2022 by 12:00 midday British Summer Time

Time allowed: 24 hours to submit

INSTRUCTIONS TO CANDIDATES:

Section A of this assessment paper consists of a set of **TEN** Multiple Choice Questions (MCQs) which you will take separately from this paper. You should attempt to answer **ALL** the questions in Section A. The maximum mark for Section A is **40**.

Section A will be completed online on the VLE. You may choose to access the MCQs at any time following the release of the paper, but once you have accessed the MCQs you must submit your answers before the deadline or within **4 hours** of starting whichever occurs first.

Section B of this assessment paper is an online assessment to be completed within the same 24-hour window as Section A. We anticipate that approximately **1 hour** is sufficient for you to answer Section B. Candidates must answer **TWO** out of the THREE questions in Section B. The maximum mark for Section B is **60**.

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

You should complete **Section B** of this paper and submit your answers as **one document**, if possible, in Microsoft Word or a PDF to the appropriate area on the VLE. Each file uploaded must be accompanied by a coversheet containing your **candidate number**. In addition, your answers must have your candidate number written clearly at the top of the page before you upload your work. Do not write your name anywhere in your answers.

UL22/1058

SECTION A

Candidates should answer the **TEN** Multiple Choice Questions (MCQs) quiz, **Question 1** in Section A on the VLE.

SECTION B

Candidates should answer **TWO** questions from Section B.

Question 2

In this question you will be considering the development of a control panel for the cab of a new underground locomotive. The control panel will prompt the driver of the train when actions need to be taken to progress the flow of the autonomous control system.

Security is of great importance for this system as it is responsible for the safe running of the train with passengers onboard.

(a) You have been asked to develop a strategy to evaluate the security of the code base for the control panel software. Describe THREE actions you would take in carrying out this evaluation.

[6]

(b) The GUI for the software is written in Python, you are tasked with using bandit to perform a static analysis on this code.

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

[2]

(ii). Give THREE examples of security flaws that bandit can find.

[6]

(c) Draw a flowchart or other diagram showing the lifecycle of the software system. The flowchart should show each of the following items and when they occur. Also consider if certain cycles should be repeated and indicate this on the diagram.

i. Unit testing
ii. Requirements testing
iii. Usability testing
iv. Accessibility testing
v. Security testing.

[10]

(d) Describe the UMUX framework for usability testing and how it differs from SUS framework.

[2]

(e) The driver should always be watching the tracks while the train is moving. Using the EARS syntax, specify TWO requirements that will avoid the driver being distracted by the system when it is not necessary.

[4]

Question 3

You are part of a team writing a system which keeps track of the bags at an airport, routing them between check-in, planes, and baggage collection. The software has the following functions:

i. updateDatabaseRecord()
ii. decodeBarcodeAndUpdateBagPosition()
iii. getBagPosition()
iv. countBagsAtLocation()

(a) Define module coupling and module cohesion.

[2]

(b) For each function, pick a type of module cohesion you think it is an example of and explain that type of module cohesion.

[6]

(c) Describe from your own experience of programming where you had to make a decision about module coupling.

(i). State how you could have solved that problem using minimal coupling.

[2]

(ii). State how you could have solved that problem using stronger coupling.

[2]

(d) You are using Git to work collaboratively on the codebase for this system. Describe, including the commands you would run, the process of:

i. making a version of the code you can work on separately
ii. making changes
iii. recombining your updated code with new code from others

[10]

(e) You find an open-source library on GitHub that you would like to include in the project you are working on.

(i). Describe TWO things you should do before including the code in your software.

[2]

(ii). In the course of your work with the library, you make changes to improve on it. Outline the steps you should go through to submit these changes to the original author for inclusion in the library.

[4]

(iii). Describe ONE positive and ONE negative of using open source code in your project.

[2]

Question 4

This question is about a computer system which allows users to upload videos of themselves dancing, and stream videos of other people dancing. This is a critical system and downtime of the service should be avoided at all costs.

Your job is to add a new feature to the platform. Since you are writing it from scratch, you decide this would be a good moment to experiment with Unit Testing.

(a) Referring to the Three Laws according to Uncle Bob, and a Unit Testing framework you have studied on this course. Describe the workflow of Unit Testing.

[9]

(b) Explain TWO ways in which Unit Testing encourages writing modular code.

[4]

(c) There is a function in the code which is responsible for uploading the video generated by the user. This function has various outcomes depending on if the upload was successful.

Write the code you would use to run the synchronous uploadVideo() in a way that does not crash if the upload fails.

[8]

(d) The app you are working on aims to be accessible to as many users as possible. Explain THREE suggestions you would make to your colleagues which would improve the accessibility of the app.
Ensure your suggestions are relevant to the dancing video app.

[6]

(e) Define White box and Black box Testing, and Explain the difference between them.

[3]

END OF PAPER