BSc EXAMINATION

COMPUTER SCIENCE

Software Design and Development

Release date: Monday 13 March 2023 at 12:00 midday Greenwich Mean Time

Submission date: Tuesday 14 March 2023 by 12:00 midday Greenwich Mean 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 **2** out of the **3** 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.

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 any **TWO** questions from Section B.

Question 2
In this question, you will 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.

(a) What is step-by-step testing?

(2 marks)

(b) You are given the following requirement:
   "Students can select a module from a list, if they have been registered to the selected module, they can see the contents."
   Write out a step-by-step process for the VLE described above that a tester can use to test this requirement. (4 marks)

(c) To specify a software/system requirement, compare using natural languages, UML and formal languages in terms of i) Expressiveness ii) Ambiguity iii) Machine interpretation
(6 marks)

(d) Write TWO requirements for the VLE, using the EARS syntax.

(4 marks)

(e) For the VLE system, we want to ask some users to answer a questionnaire to do usability testing. Design two questions to cover effectiveness, two questions to cover efficiency and two questions to cover satisfaction.
(6 marks)

(f) You have been editing the code on a branch you have created on the Git repository for the software. 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.
(4 marks)

(g) State and describe two types of coupling that you should try to avoid when implementing a program.
(4 marks)

Question 3

You are part of a team writing a system which keeps track of envelopes people send through the postal system. The process begins when a person gives the envelope to a post office, at which point a barcode (containing all necessary information) is generated, and the envelope is labelled. Then, it is possible to keep track of the envelope between different cities/offices. The software has the following functions:

    i.   generateBarcode()
    ii.   createDatabaseRecord()
    iii.   updateDatabaseRecord()
    iv.   decodeBarcodeAndUpdateEnvelopPosition()
    v.   getEnvelopPosition()

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

(4 marks)

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

(6 marks)

(c) 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 on which you can work separately

    ii.   making changes

    iii.   recombining your updated code with new codes from others

(10 marks)

(d) 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 that must be done before including the code in your software.

(2 marks)

    ii.   b. Describe ONE positive and ONE negative thing about using open-source code in your project.

(2 marks)

(e) 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)

(f) Compare Python and JavaScript in terms of Robust Programming.

(2 marks)

Question 4

You are examining a piece of code that you found on GitHub as it might be useful in a piece of software that you are writing. The code can be used for developing a file server.

(a) Assume there is a module named UploadFile(path) which takes a string as its parameter (it is the path of a file on your local computer) and then uploads the file to the server. This function has various outcomes depending on if the upload was successful. Write the code that you would use to run the synchronous UploadFile(path) in a way that doesn't crash if the upload fails (for example if the file does not exist in the given path)

(6 marks)

(b) Assume that we have completed our program. To test the functionality mentioned in part a, we run the program and as input, we enter some different (both correct and incorrect) paths. What is this type of test, black box or white box? Explain your reasons.

(4 marks)

(c) You decide that the code is inefficient and start from scratch using unit testing to make your code efficient. Describe the workflow of Unit Testing, using the Three Laws According to Uncle Bob.

(6 marks)

(d) Assume that you are using this piece of code in a critical system. Thus, you have been asked to conduct a static security audit on the code. Give TWO examples and descriptions of the kind of problems you would expect a static security audit to find.

(4 marks)

(e) What is Event-driven requirements analysis? How are requirements are specified in this category.

(4 marks)

(f) What are loose and tight coupling?

(2 marks)

(g) During the course, you have used the bandit code analyser to detect problems in Python code. Present a code fragment which illustrates a problem that the bandit can detect.

(4 marks)

END OF PAPER