



BSc EXAMINATION

COMPUTER SCIENCE

Software Design and Development

Release date: Thursday 17 March 2022 at 12:00 midday Greenwich Mean Time

Submission date: Friday 18 March 2022 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 **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. 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 in Section B.

Question 2

In this question you will be considering the development of a platform through which people working from home can monitor and control machines such as 3D printers, working in a factory.

(a) You are provided with the following requirement.

“User can select a 3D model file from a list and add it to a queue for one of the printers.”

Write out a step-by-step process that a tester can use to test this requirement.

(4 marks)

(b) Write TWO requirements for the monitoring part of the platform, using the EARS syntax.

(4 marks)

(c) Draw a flowchart or other diagram showing the lifecycle of the software system. The flowchart or diagram 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.

(8 marks)

(d) Describe THREE things a developer could do to make this system accessible. Ensure your suggestions relate to the context mentioned above with the 3D printer management system.

(6 marks)

(e) Reflect on your experience with Usability Testing. Describe ONE positive and ONE negative experience.

(4 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)

Question 3

You have been brought onboard a team who are in the process of re-writing a financial analysis tool in Python, so it can be more easily maintained in the future.

(a) You have been asked to conduct a static security audit on the codebase for one of the analyses.

(i). What is the difference between a static and dynamic security audit?
(2 marks)

(ii). Give TWO examples and descriptions of the kind of problems you would expect a static security audit to find.
(4 marks)

(b) Compare Python and JavaScript on the following points:

(i). Encouraging Secure Programming
(3 marks)

(ii). Encouraging Robust Programming
(3 marks)

(iii). Encouraging Modular Programming
(3 marks)

(c) 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 bandit can detect.

(6 marks)

(d) Name and describe THREE methods of pausing a program when debugging.

(3 marks)

(e) In “Structural Epochs in the Complexity of Software over Time” (2008), Sangwan et al. introduce the concepts of ‘Fat’ and ‘Tangle’. Explain these terms, as they refer to module coupling.

(2 marks)

(f) State and describe TWO types of beneficial module coupling that might be present in this piece of software.

(4 marks)

Question 4

You are examining a piece of code you found on GitHub as it might be useful in a piece of software you are writing.

- (a) What TWO things should you do before including the code in your software?
(2 marks)
- (b) You find that one function in the code you have found, alters the actions of another function. State and describe the type of module coupling present in the code.
(2 marks)
- (c) You decide that the code is inefficient and start from scratch using unit testing to make your code efficient. Describe the process of unit testing, using the Three Laws According to Uncle Bob.
(4 marks)
- (d) Reflect on your experience carrying out test driven development. Describe ONE negative and ONE positive experience.
(4 marks)
- (e) Using diagrams, if necessary, explain why unit testing encourages you to write modular code.
(4 marks)
- (f) You are writing code for a webserver in JavaScript that should keep running at all costs. There is a risky function that queries a database that is unreliable.

Write the code you would use to run the synchronous 'checkDatabase()' function in a way that does not crash the program if it fails.
(8 marks)
- (g) Describe the difference between white/clear box testing and black box testing.
(2 marks)
- (h) You think the code you have written improves upon the code you found on GitHub. Explain the process of submitting your code to the original developer to improve the repository, and why you would do this.
(4 marks)

END OF PAPER