**SEMESTER ONE EXAMINATION – 2022 / 2023**

**MAIN**

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| **DEPARTMENT:** | Computing |
| **MODULE TITLE:** | Concurrent and Parallel Systems |
| **MODULE LEADER:** | Chris Bates |
| **EXAM DATE:** | 12/01/2023 at 09:30 UK time |
| **DURATION:** | 4 hours (Including 15 minutes reading time) |

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**EXAMINATION CONDUCT:**

1. The [University Academic Conduct Regulation](https://students.shu.ac.uk/regulations/conduct_discipline/Academic%20Conduct%20Regulations%202018-19.pdf) outlines the behavioural expectations of candidates completing any examination.
2. Students are responsible for ensuring that they know how to submit their exam script, when the deadline is and that they submit the script in enough time before the deadline expires. It is anticipated that Blackboard will be slower around submission times.
3. It is a fundamental principle that students are assessed fairly and equitably. The [University Academic Conduct Regulation](https://students.shu.ac.uk/regulations/conduct_discipline/Academic%20Conduct%20Regulations%202018-19.pdf) defines unfair behaviour relating to an examination to be 'cheating'. The University will investigate and may sanction any acts or behaviours which breach the Code of Academic Conduct.
4. Students are reminded that this is an individual task and that students who contact or collude with other students to complete their exam may be subject to sanction later.

**INSTRUCTIONS TO CANDIDATES:**

1. This is a time limited examination; you are responsible for managing your time appropriately. The duration is shown at the top of this page and explained below:

The exam will begin at 09:30 and end at 13:30 (unless you have additional examination requirements as stated in a learning contract).

* The time you have been allocated includes the following:
* 15 minutes reading time at the start
* 15 additional minutes of inclusive support for each hour of the exam
* You also have an additional 15 minutes submission time following the end of your assessment time to address minor IT issues such as buffering/slow uploads
* The last 15 minutes is submission time not working time that must be used for submitting your work. Submissions made after this time will not be marked (unless there are [extenuating circumstances](https://academic.shu.ac.uk/assessment4students/development-and-support/extenuating-circumstances/)).

1. Answer **all** questions.
2. Submit your answers in a Word document, or in a Word-compatible format.
3. You must cite all sources. APA referencing is required for all questions.
4. You may choose to include code fragments where doing so supports or clarifies your answer. Any code that you include will be marked for meaning and clarity but not for syntax.
5. Your answers will be marked using the criteria that are set out in the University’s Common Grade Descriptor.
6. Academic support will be available for the 15 minutes of reading time from 09:30 via a Collaborate session on the module’s Blackboard site.
7. It is possible that you may encounter technical issues during the exam; if you have any difficulty with IT you should consult the below student guidance document on My Hallam which contains useful information on hints and tips, contact numbers and links to support: <https://www.shu.ac.uk/~/media/home/myhallam/Guides/student-exam-guidance.docx>
8. Any changes or clarification to the exam paper will be communicated via the module Blackboard site announcements. It is recommended that students monitor Blackboard announcements prior to submission of their final script but particularly in the first hour after release of the exam paper.

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Question one

Describe the following concepts. Use supporting code fragments in the style of C++ as appropriate.

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| a. | ~~Concurrency.~~ | (5 marks) |
| b. | ~~Threads.~~ | (5 marks) |
| c. | ~~Mutex variable.~~ | (5 marks) |
| d. | ~~A future.~~ | (5 marks) |

Question two

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| --- | --- | --- |
| a. | Define the term deadlock, giving a supporting example. | (15 marks) |
| b. | Using fragments of code show how deadlock can be avoided in C++? | (15 marks) |

Question three

In your answers to this question, consider a compression application, such as 7-Zip or WinRAR, that creates a single compressed file from one or more other files.  The uncompressed files are each compressed independently to make up the final compressed file.

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| --- | --- | --- |
| a. | ~~What is meant by thread pooling?~~ | (6 marks) |
| b. | ~~Discuss the benefits and drawbacks of using thread pooling~~ | (9 marks) |
| c. | Show how a thread pool may be implemented in C++. | (10 marks) |

Question four

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| --- | --- | --- |
| a. | ~~Describe your solution to the coursework problem and discuss the performance improvements you undertook including any consequences of the directions you took~~ | (15 marks) |
| b. | ~~Discuss the process of testing your coursework submission.~~ | (10 marks) |

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