ATHLONE INSTITUTE OF TECHNOLOGY

FACULTY OF ENGINEERING & INFORMATICS

SEMESTER 1 EXAMINATIONS 2017

December Session

BACHELOR OF SCIENCE IN SOFTWARE DESIGN (CLOUD/GAME)
BACHELOR OF SCIENCE IN SOFTWARE DEVELOPMENT (MOBILE)

YEAR 3

OPERATING SYSTEMS & CONCURRENCY 3

External Examiner(s): **Mr Jerh O Connor**
Dr Steven Davy
Mr Tom Nolan

Internal Examiner(s): **Mr Paul Lennon**

Instructions to candidates:
Read all questions carefully.
All questions carry equal marks.
Answer **Three** out of **Four** questions.

Time Allowed: 2 Hours

No. of pages including cover sheet: 3

Q.1. (a) In Process Management what is a context switch? Explain how an Operating System can implement a context switch. Your answer should include a description of the run and blocked queues.

(6 marks)

(b) Give two classifications of processes and explain how a Processing Scheduling algorithm should treat the two types of process.

(6 marks)

(c) Illustrate a Process State transition diagram. Explain the purpose of each state and possible transitions from state to state. Explain how the type of process e.g. MS Word\Media Player can effect state transitions.

(8 marks)

[20 marks]

Q.2. (a) Briefly explain the difference between a process and a thread.

(4 marks)

(b) Compare and contrast the two ways of creating and starting threads in Java. Give example code to demonstrate your answer. Explain why a programmer may choose one way of creating threads over the other.

(7 marks)

(c) Explain what the thread methods start(), run(), yield(), sleep() and join() do.

(5 marks)

(d) How can one obtain a thread-safe instance of a class such as HashMap (which is not itself thread-safe)? How should it be used correctly?

(4 marks)

[20 marks]

Q.3. (a) Explain the following terms: main memory, cache memory, multi-core architecture. Use a diagram to illustrate your answer.

(6 marks)

(b) Explain the function of a Cache Coherence algorithm. Describe the MESI protocol explaining the four states of data.

(8 marks)

(c) With regard to a concurrent application explain the term liveness. Briefly explain **three** common liveness issues for a concurrent application.

(6 marks)

[20 marks]

Q.4. (a) What are the advantages and disadvantages of the following implementations of a Web Server?

(i) Singly Threaded Web Server
(ii) Multi-Threaded Web Server with thread for every request.
(ii) Thread Pool based Web Server

(6 marks)

(b) Explain how the java.util.concurrent separates task submission and task execution. In particular what are the relevance of the interfaces Executor and ExecutorService?

(7 marks)

(b) How do you obtain ExecutorService objects that implement the following ThreadPool strategies

- FixedThreadPool
- CachedThreadPool

What strategies do these ThreadPools implement?

(7 marks)

[20 marks]