Beijing-Dublin International College

SEMESTER 1 FINAL EXAMINATION - (2023/2024)

School of Computer Science

COMP2012J Operating Systems

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Time Allowed: 120 minutes

Instructions for Candidates:

Answer all questions

BJUT Student ID:_____ **UCD Student ID:**_____

I have read and clearly understand the Examination Rules of both Beijing University of Technology and University College Dublin. I am aware of the Punishment for Violating the Rules of Beijing University of Technology and/or University College Dublin. I hereby promise to abide by the relevant rules and regulations by not giving or receiving any help during the exam. If caught violating the rules, I accept the punishment thereof.

Honesty Pledge:_____ **(Signature)**

Instructions for Invigilators

No rough-work paper is to be provided for candidates.

1. With the *Least Recently Used* replacement policy, given four frames and eight pages, how many page faults will occur with the reference string: `76131724152323364240`. Assume that the four frames are initially empty. Here the digits in the reference string are the page numbers. **(3)**

2. Page size determines internal fragmentation of a system. Give one advantage of small page sizes, and give one advantage of large page sizes. **(3)**

3. Events are usually signalled differently by hardware and software. How do hardware and software interrupt the CPU? **(4)**

4. What is paging? What is the fundamental problem that it solves? Explain the basic method of implementing paging. **(6)**

5. Give three advantages that *multiprocessor* systems have over *uniprocessor* systems. **(6)**

6. What is a *process control block*? Describe the information it contains. Draw a diagram of a typical process control block. **(6)**

7. Under what conditions is scheduling done? What is the difference in scheduling between cooperative and preemptive multitasking? **(6)**

8. What is meant by *protection* in operating systems? Describe two basic goals of protection. Also, give two basic principles used while implementing protection mechanism. **(8)**

9. List the responsibilities of a filesystem. Describe two ways of structuring directories in a filesystem. Give one advantage and one disadvantage of each of the two basic ways of structuring directories. **(8)**

10. Describe the possible states that a *process* may be in. Draw a diagram showing the possible transitions between these states **(10)**

11. Define *deadlock* and describe four conditions necessary for deadlock to occur. **(10)**

Total marks for the paper: 70