Beijing-Dublin International College

SEMESTER 1 FINAL EXAM - (2024/2025)

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. What is a *kernel mode* and *user mode*? What is the significance of these modes and how can you switch between the two modes? **(4)**

2. With the *First In First Out* 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. Show how you found your answer. **(4)**

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

4. What is a *Translation Lookaside Buffer* or TLB? Describe the role of a TLB. **(6)**

5. What is meant by a *distributed system*? Give four reasons for building distributed systems. **(6)**

6. What are the objectives of process scheduling? Briefly describe two CPU scheduling algorithms. **(6)**

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

8. What is a *semaphone*? Explain with an example how you can implement mutual exclusion using a semaphone. **(6)**

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 what is segmentation and paging and highlight their differences. Using diagrams show how segmentation and paging performs address translations. **(10)**

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

12. Define *deadlock* and *starvation*. Describe what are the differences between deadlock and starvation with a small example. **(10)**

(Sub-total for the section: 80)

Total marks for the paper: 80