



Beijing-Dublin International College



SEMESTER 1 FINAL EXAMINATION - (2021/2022)

School of Computer Science

COMP2006J Operating Systems

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Time Allowed: 120 minutes

Instructions for Candidates:

Answer succinctly and to the point

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. Consider a primary memory with four frames, how many page faults will occur with the following page replacement algorithms and corresponding reference strings:
 - (a) 76131724152323364240 — *Optimal Replacement Policy*
 - (b) 6613152000243607 — *Least Recently Used Policy*
 - (c) 2476152337253723 — *Clock Policy*Assume that in each case, the four frames are initially empty. Show your working for each policy. (10)
2. Explain the difference between a *distributed OS* and a *parallel OS*. (4)
3. What is the main difference between a *program* and a *process*? (2)
4. What is meant by a context switch? Why do operating systems perform a context switch? Give one disadvantage of context switching too rapidly (5)
5. On unix-like systems, the system-call `fork` is used to create a new process. In this context, it is said that *fork returns twice*. Explain what this means (4)
6. Give three examples of security threats. For each example, also suggest a way to avoid it or mitigate the threat. (6)
7. Define *deadlock* and describe four conditions necessary for deadlock to occur (6)
8. What is paging? What is the fundamental problem that it solves? Explain the basic method of implementing paging. (5)
9. What is a *process control block*? Describe the information it contains. Draw a diagram (8)
10. Describe the possible states that a *process* may be in. Draw a diagram showing the possible transitions between these states (10)
11. What is a *semaphore*? What is it used for? Give pseudo code describing the permissible operations on a semaphore (10)
12. In the context of protection, what is the *confinement problem*? Give an example (3)

13. List any two responsibilities of a filesystem. Describe two ways of structuring directories in a filesystem. Give an advantage and disadvantage of each. **(7)**

Total marks for the paper: 80