Beijing-Dublin International College

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SEMESTER I RESIT EXAMINATION - 2016/2017
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School of Computer Science

COMP 2006J Operating Systems

Prof. Pádraig Cunningham
Asst Prof Abraham Campbell

Time Allowed: 120 minutes

Instructions for Candidates

All questions carry equal marks. The distribution of marks in the right margin shown as a percentage gives an approximate indication of the relative importance of each part of the question.

<u>Answer 3 out of 5 Questions</u>

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)**

Question 1:

1. Why is multiprogramming so dependent on process scheduling and what advantages does it provide?

(9 points)

2. Describe what tasks the Long-term, Medium-term and Short-term scheduler performs in process scheduling

(7 points)

3. Why would you use *pre-emptive scheduling* ?

(7 points)

4. Briefly describe five Scheduling Algorithms

(10 points)

Question 2:

1. What is a *semaphore* ? Give pseudo code describing the permissible operations on a *semaphore*.

(9 points)

2. Describe the *mutual exclusion* problem. What is a *critical section*?

(8 points)

3. How can semaphores be used to solve the *mutual exclusion* problem ?

(7 points)

4. Define appropriate semaphores and add semaphore operations to the following code to give a correct solution to the *Milk Problem:*

```
if (No_Milk)
{
  Buy_Milk()
}
```

(9 points)

Question 3:

1. Describe memory management and justify its importance in multiprogramming systems in terms of CPU utilization

(9 points)

2. Define the issues involved in *memory organization* and describe the different solutions to allocation in memory

(8 points)

3. Describe, using separate diagrams, the techniques of *paging* and *segmentation*

(16 points)

Question 4:

1. Briefly describe following operating systems architectures and explain their advantages and disadvantages to each other
    a) Monolithic
    b) Layered
    c) Microkernel

(15 points)

2. Why does an Operating system require *Protected Instructions?*

(6 points)

3. Why is memory protection important and how is achieved using a base and limit register?

(12 points)

Question 5:

1. Define the term "PCB" in relation to operating systems?

(9 points)

2. Define the term "Process". Define all the possible process states, for full marks please include a diagram.

(10 points)

3. Explain the concept of a Child and Parent Process

(7 points)

4. Explain the concept of a Thread and the motivation behind its development

(7 points)