# Semester One of Academic Year (2014---2015) of BJUT

## 《 Operating Systems 》 Exam Paper A

**Exam Instructions：** **Answer 3 out of 5 Questions**

**Honesty Pledge：**

I have read and clearly understand the Examination Rules of Beijing University of Technology and University College Dublin and am aware of the Punishment for Violating the Rules of Beijing University of Technology and 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 would accept the punishment thereof.

**Pledger：** _____ **Class No：** _____

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

Notes：

The exam paper has 2 parts on 3 pages, with a full score of 99 points. You are required to use the given Examination Book only.

| Obtained score |
| --- |
| |

**Part 1:**

# Question 1

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 2

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 3

1. Define the possible states in which a *process* may be in

**(8 points)**

2. What information is contained in a *Process Control Block*

**(9 points)**

3. Explain the concept of a *Child* and *Parent* Process

**(7 points)**

4. Describe the permissible operations on a process. Draw a process state diagram showing how a process may change state.

**(9 points)**

| Obtained score |
| --- |
| |

**Part 2:**

# Question 4

1. Why is security such an important issue in operating systems?

**(10 points)**

2. Using diagrams with actors called Alice, Bob and Carol, describe four potential security attacks that Carol can perform on Alice and Bob's communication ?

**(8 points)**

3. Describe the importance of *user authentication* and describe how you would identify a user in an operating system

**(15 points)**

# Question 5

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 *preemptive scheduling* ?

**(7 points)**

4. Briefly describe five Scheduling Algorithms

**(10 points)**