

**DUBLIN INSTITUTE OF TECHNOLOGY  
KEVIN STREET, DUBLIN 8.**

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# **BSc. (Honours) Degree in Computer Science**

**Year 1**

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**SEMESTER 2 EXAMINATIONS 2012/2013**

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## **Operating Systems 1**

Mr. Ken O'Brien  
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20<sup>th</sup> May 2013  
16:00 – 18:00

Answer **THREE** Questions out of **FOUR**

**Q1**

- (a.) Explain, with the aid of a diagram, the Von Neumann architectural model of a computer. (10 marks)
- (b.) Describe the operation of an instruction cycle in a simple computer. (6 marks)
- (c.) What is an assembler language and what are the advantages of using one in comparison to machine code? (6 marks)
- (d.) The Little Man model of a computer system uses a single-digit op-code and 2-digit memory addressing and has the following instructions defined where the address portion is shown as xx

Op. Code	Description
1xx	Add value in memory to accumulator
2xx	Subtract value in memory from accumulator
3xx	Store accumulator value to memory
5xx	Load value in memory to accumulator
6xx	Branch to memory location
7xx	Branch on positive to memory location
8xx	Branch on negative to memory location
901	Input from In-tray to accumulator
902	Output to out-tray from accumulator
0xx	Halt

Write a program to read 2 numbers which are input to the in-basket and display the sum of those numbers in the out-basket. Comment every instruction.

(12 marks)

**Q2**

- (a.) Write a short essay on each of the following data storage devices:
- (i) Magnetic Tape
  - (ii) Magnetic Disk Storage
  - (iii) CD-Rewritable storage
  - (iv) Flash Memory
- (16 marks)
- (b.) Discuss the factors affecting magnetic disk data access speed. (5 marks)
- (c.) Define the following terms:
- (i) Field
  - (ii) Record
  - (iii) File
- (6 marks)
- (d.) Describe two methods of physical file organization on a magnetic disk. (6 marks)

### Q3

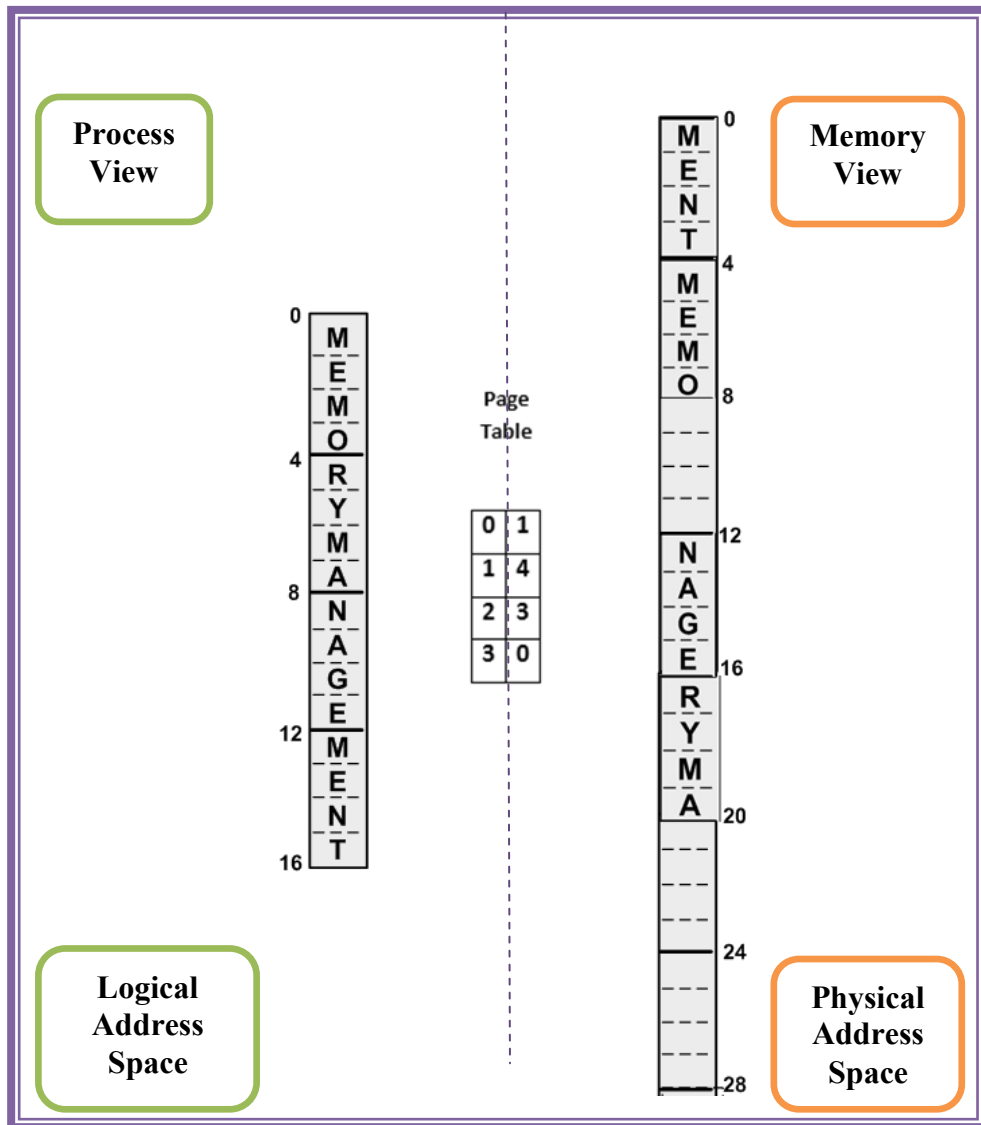
- (a.) Identify and explain in detail any 3 pre-emptive scheduling policies. (9 Marks)
- (b.) An Operating System must implement some form of protection on its file system, specifically who can access files and how can they access files. UNIX-based and Windows NT-based Operating Systems implement different forms of access control for users. Identify and explain both methods. In your answer highlight any positive or negative aspect(s) of each approach. (10 Marks)
- (c.) Outline briefly the elements of a *Process Control Block*. Support your answer with an appropriate diagram. (5 Marks)
- (d.) Explain what the *Principle of Locality* is? Identify two examples of this principle you have encountered during your studies. (5 Marks)
- (e.) Consider the following statement with regard to Process Management:

*“To ensure integrity of a shared resource or data, it is required that at most one process is executing in its **Critical Region** at one time”*

Describe with the aid of a diagram how the access of two competing processes to a *Critical Region* is enforced. (4 Marks)

### Q4

- (a.) Consider the following snapshot of a process' logical memory view and the corresponding physical memory allocation at a given time, in a simple paged memory management system.



Note: The simple text string 'MEMORYMANAGEMENT' is used to represent data stored in a logical address space and there are 8 bits (1 character) per byte.

- (i.) How many bytes per page? (3 Marks)
  - (ii.) How many bytes per frame? (3 Marks)
  - (iii.) In the form of page no. and displacement (p, d), what is the Logical Address of the character 'O' in 'MEMORYMANAGEMENT'? (6 Marks)
  - (iv.) Using the Page Table provided, show how the letter Y can be mapped from its Logical Address (p,d) to its Physical Address in the form page frame no., displacement (f, d) showing clearly your reasoning. (6 Marks)
- (b.) With reference to Memory Management explain the following terms
- (i) Fragmentation
  - (ii) Paging
  - (iii) Swapping
  - (iv) Trashing (12 Marks)
- (c.) Briefly explain what a Shell is and give two examples of shells used in UNIX. (3 Marks)