

Year	Year 2
Semester	Semester 1
Date of Examination	Weds 23rd Jan 2013
Time of Examination	3.30pm – 5.30pm

Prog Code	BN002	Prog Title	Higher Certificate in Science in Computing in information Technology	Module Code	COMP H2028
Prog Code	BN013	Prog Title	Bachelor of Science in Computing in Information Technology	Module Code	COMP H2028
Prog Code	BN104	Prog Title	Bachelor of Science (Honours) in Computing	Module Code	COMP H2028

Module Title	Operating Systems (Client)
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External Examiner(s): Dr. Tom Lunney
Mr. Michael Barrett

Instructions to candidates:

1. Question One in Section A is **COMPULSORY**.
2. Candidates should attempt **ALL** parts of Question One in Section A
3. Candidates should attempt **TWO** questions from Section B
4. Question One is worth 40 marks, and all other questions are worth 30 marks each.

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SECTION A: COMPULSORY QUESTION

Question 1: Answer ALL parts of this question (4 marks for each part)

- a) Distinguish between the concept of a *soft real-time operating system* and a *hard real-time operating system*.
- b) With reference to memory management, consider a paging system with the *page table* stored in memory.
 - i. If a memory reference takes **200 ns**, how long does a paged memory reference take?
 - ii. Consider the addition of a *translation look-aside buffer (TLB)*. If **85%** of all page-table references are found in the *TLB*, and if finding a page-table entry in the *TLB* takes **zero time** (if the entry is there), what is the *effective access time (EAT)*?
- c) Explain the concept of *multiprogramming* in an operating system.
- d) Briefly describe **two** possible rules of thumb when determining the *time quantum* in a *round robin* scheduling scheme.
- e) List **four** objectives of a good *process scheduling policy* for an operating system.
- f) Describe the difference between a *process* and a *thread*. Give **one** advantage of threads over processes.

Question 1 is continued on the next page

- g) Why is it considered bad practice to log directly into a Linux GUI-based system as *root*?
- h) Consider the situation where a user downloads the source-code *tarball* of an application they wish to install on their Linux system. Using the *tar* command, the user has extracted the files from the *tarball* into their home directory, and now wishes to install the application. List the steps that the user must type to *configure*, *compile* and *install* the software on their system. For each step, provide the command prompt symbol to indicate whether an ordinary user or *root* should type the command.
- i) Consider the situation where a user has just purchased a **third** Serial-ATA hard disk drive for their Linux system. They install the disk, boot up their computer, log in as an ordinary user and run a *konsole* terminal window. Provide the commands, required by the user, to run a command-line partitioning tool which will allow them to start the procedure of partitioning the new disk. (You **do not** have to provide the partitioning tool options for actually creating partitions).
- j) In relation to Linux, explain what a *Makefile* is. List and briefly describe its **three** essential elements.

(40 Marks Total)

SECTION B: ANSWER ANY TWO QUESTIONS

Question 2

- a) Explain the concept of a *kernel* of an operating system.

(4 marks)

- b) Explain by what mechanism, and for what reasons, the switch from *user mode* to *kernel mode* takes place.

(8 marks)

- c) Describe, with the aid of a diagram, the *UNIX System V Release 4* Process State Model, indicating the transitions between states, and the reasons for those transitions.

(14 marks)

- d) Briefly explain why the *UNIX System V Release 4* operating system is not suitable for *real-time* processing.

(4 marks)

(30 Marks Total)

Question 3

- a) In relation to memory management, explain the following terms:
logical address, physical address, page fault, thrashing.
(4 marks)
- b) Describe a simple method which allows memory to be addressed as a set of
pages each containing a fixed number of *displacements*.
(4 marks)
- c) Explain the term *page replacement*, and why it is needed.
(4 marks)
- d) Describe any **two** of the following page replacement algorithms: *Least Recently Used (LRU)*, *Not Recently Used (NRU)*, *First-In First-Out (FIFO)* and *Clock*.
(8 marks)
- e) (i) In relation to *virtual memory* based on *paging*, explain the constraints regarding storing the *page table* of every process in *real memory*.
(6 marks)
- (ii) In relation to *virtual memory* based on *paging*, briefly explain how the location of the *page table* of the currently running process is located.
(4 marks)

(30 Marks Total)

Question 4

- a) In Linux, what do the letters *GRUB* stand for? Explain what GRUB actually does.

(4 marks)

- b) List and describe the **six** distinct phases involved in bootstrapping a Linux Operating System.

(12 marks)

- c) Briefly describe **six** tasks, which are generally performed by *start-up scripts* during the bootstrapping of a Linux Operating System.

(6 marks)

- d) (i) With reference to Linux, explain the concept of a *run-level*.

(2 marks)

- (ii) Describe each of the defined *run-levels*.

(6 marks)

(30 Marks Total)