

INSTITUTE OF TECHNOLOGY BLANCHARDSTOWN

Year	Year 2
Semester	Semester 1
Date of Examination	Autumn 2012
Time of Examination	Tuesday 21 st August 2012

1.00pm - 3.00pm

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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Internal Examiner(s):

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External Examiner(s):

Dr. Richard Studdert

nstructions to candidates:

- Question One in Section A is COMPULSORY.
- 2. Candidates should attempt ALL parts of Question One in Section A
- 3. Candidates should attempt <u>ONE</u> question from Section B, and <u>ONE</u> question from Section C
- This paper is worth 100 marks.
- 5. 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) In Linux, explain the purpose of the mkfs command.
- b) Briefly describe the *Clock page-replacement algorithm* commonly used in memory management.
- c) Briefly explain two mechanisms, by which different programs in a Linux operating system specify the log files to which they write. Give an example of one program in each case.
- d) In Linux, distinguish between the ext2 filesystem and the ext3 filesystem.
- e) In relation to UNIX/Linux, explain the concept of the *Process Tree*. Your answer should make reference to the terms *PID*, *PPID* and *init*.
- f) If the page size in a particular operating system is 4 K, and the virtual address space is 4 GB, what is the maximum number of pages available? If each page table entry is 2 Bytes, how much space is required to store the whole page table?

Question 1 is continued on the next page

g) The output below is obtained from a real Linux system using the command indicated. Identify Primary Partition(s) (if any) and Logical Partition(s) (if any).

[root@feynman ~]# fdisk -l /dev/sdd

Disk /dev/sdd: 500.1 GB, 500107862016 bytes 255 heads, 63 sectors/track, 60801 cylinders Units = cylinders of 16065 * 512 = 8225280 bytes

Sector size (logical/physical): 512 bytes / 512 bytes I/O size (minimum/optimal): 512 bytes / 512 bytes

Disk identifier: 0x00062d08

Device	Boot	Start	End	Blocks	Id	System
/dev/sdd1	*	1	38349	308037318+	7	HPFS/NTFS
/dev/sdd2		38350	60801	180345690	5	Extended
/dev/sdd5		38350	60801	180345658+	83	Linux

- h) Distinguish between user mode and kernel mode in an Operating System.
- i) In relation to parallel operating systems, what do the letters COTS stand for?
- j) In Linux, explain the letters, GRUB.

(40 Marks Total)

SECTION B: ANSWER QUESTION 2 or QUESTION 3

Question 2

a) Explain the concept of multiprogramming. By comparing the execution time of N processes in a uni-programming versus a multiprogramming system, show, using a mathematical argument <u>or</u> diagrams, how multiprogramming increases system efficiency.

(12 marks)

b) Explain the following terms with regard to Process Management: ageing, time quantum, thread, context switch.

(4 marks)

- c) (i) Describe the First-Come First-Served scheduling algorithm by addressing the following questions:
 - Is it Pre-emptive or Non-pre-emptive?
 - What are the uses of this algorithm?
 - What are the disadvantages of this algorithm?

(3 marks)

(ii) The following table contains data concerning **five** different processes when the *First-Come First-Served* scheduling algorithm is used (all processes are assumed to arrive at time 0 in the order Process #1, #2, #3, #4, #5):

Process #	Estimated Run Time	Waiting Time		
1	2	0		
2	60	2		
3	1	62		
4	3	63		
5	50	66		

Using the same data, compile a corresponding table for the Shortest Job First scheduling algorithm.

(5 marks)

(iii) Using the average waiting time as a metric for comparing the efficiency of the two scheduling algorithms in part (c)(ii) above, which algorithm is more efficient? Give reasons for your answer.

(6 marks) (30 Marks Total)

Question 3

a)	(i)	In relation to memory managemen	t, describe,	in	detail,	the	methods	of	simple
		paging and simple segmentation.							

(10 marks)

(ii) Explain the allocation problems associated with simple segmentation, and how these might be addressed.

(4 marks)

b) In relation to virtual memory using simple paging, explain the concept of the working set model. Your answer should refer to the terms: locality of reference, working set window, working set, resident set.

(8 marks)

c) Explain the terms: *Translation Look-aside Buffer* and *Associative Mapping*.

(4 marks)

- d) 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 **75**% of all page-table references are found in the *TLB*, and if finding a page-table entry in the *TLB* takes **10 ns** (if the entry is there), what is the *effective access time* (*EAT*)?

(4 marks)

(30 Marks Total)

SECTION C: ANSWER QUESTION 4 or QUESTION 5

Question 4

a)	Briefly describe three common logging schemes employed by UNIX/Linux System
	Administrators. For each scheme, outline one advantage and one disadvantage.

(6 marks)

b) Briefly explain the **three** mechanisms, by which different programs in a Linux operating system specify the log files to which they write. Give an example of **one** program for one of these mechanisms.

(4 marks)

- c) Discuss Linux kernel logging, under the following headings:
 - i. Boot-time Logging
 - ii. Ongoing Logging
 - iii. Message Duplication across Logfiles
 - iv. Console Management

(8 marks)

- d) Describe the syslog system under the following headings:
 - i. What is it?
 - ii. Components
 - iii. Operation
 - iv. Configuration

(12 marks)

(30 Marks Total)

Question 5

a)		Distinguish between automatic and manual booting in Linux.	
		(2	? marks)
b)		List and describe the six distinct phases involved in bootstrappin Operating System.	g a Linux
		(12	? marks)
c)		Briefly describe six tasks, which are generally performed by scripts during the bootstrapping of a Linux Operating System.	start-up
		(6	6 marks)
d)		With reference to Linux:	
	(i)	Explain the concept of a <i>run-level</i> .	? marks)
	(ii)	State how many run-levels are supported in Linux, and hare actually defined.	ow many
			? marks)
	(iii)	Describe each of the defined <i>run-levels</i> .	i marks)
		(30	Marks Total ,