Institute of Technology
Blanchardstown
itb

INSTITUTE OF TECHNOLOGY
BLANCHARDSTOWN

HIGHER CERTIFICATE IN SCIENCE IN COMPUTING
IN INFORMATION TECHNOLOGY – BN002 Year 2

BACHELOR OF SCIENCE IN COMPUTING
IN INFORMATION TECHNOLOGY – BN013 Year 2

BACHELOR OF SCIENCE (HONOURS)
IN COMPUTING – BN104 Year 2

Operating Systems (Client)
COMP H2028

Stage 2
Semester 1

Internal Examiner(s): Dr. Kevin Farrell

External Examiner(s): Mr. John Dunnion
Dr. Richard Studdert

Wednesday 20th August 2008
10.00am – 12.00pm

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 ONE question from Section B, and ONE question from Section C
4. 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 each part)*

a) In relation to UNIX/Linux, what is redirection? What are pipes? Briefly explain how each are used.

b) Briefly describe the *Clock page-replacement algorithm* commonly used in memory management.

c) In relation to Linux, briefly explain the concept of a *daemon* and the concept of a *run-level*. What, if any, is the relationship between them?

d) In the context of UNIX, explain the letters *FHS*.

e) Explain the concept of a *file link* in Linux. Distinguish between a *hard link* and a *symbolic link*.

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 for the whole page table?

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

h) Distinguish between *user mode* and *kernel mode* in an Operating System.

i) Distinguish between *soft real time operating systems* and *hard real time operating systems.* Give one example in each case of where such a type of real time system is used.

j) Describe the sequence of steps required, (which does not involve re-installing the operating system), to re-install the *LILO boot loader* into the *MBR* on a *Mandriva Linux* operating system that no longer boots.

(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 both a *uniprogramming* system and a *multiprogramming* system, show 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 similar table for the *Shortest-Job First* scheduling algorithm.

(5 marks)

(iii) Using the *average waiting time* as a metric for comparing how efficient the algorithms in part (c)(ii) are, which is better? Give reasons for your answer.

(6 marks)

(30 Marks Total)

Question 3

a) Describe **two** different techniques used by operating systems to keep track of files. Give an example in each case of an operating system that uses each technique.

(4 marks)

b) In relation to file management systems, briefly explain the terms *stream-block translation* and *record-stream translation*.

(6 marks)

c) Describe in detail the file space allocation method used by UNIX, explaining how files of different sizes are stored on disk, and the advantages and disadvantages of the method used.

(8 marks)

d) Assuming a *block* size of 512 Bytes, calculate the maximum size of a disk file using the UNIX *i-node* system. Assume an *address pointer* size of 4 Bytes.

(4 marks)

e) Assuming a *cluster* size of 4 K for an MS-DOS system, calculate the maximum addressable disk space. Repeat the calculation for an MS Windows 98 system employing FAT32.

(8 marks)

(30 Marks Total)

SECTION C: ANSWER QUESTION 4 <u>or</u> QUESTION 5

Question 4

a) With reference to the Linux Operating System, describe the **/etc/passwd** and the **/etc/shadow** files under the following headings:

    i. What is their purpose?
    ii. What do they contain?
    iii. The differences between them.

(6 marks)

b) How many fields are used on each line in both the **/etc/passwd** and the **/etc/shadow** files? Describe the purpose of the different fields in each case.

(12 marks)

c) With reference to the Linux Operating System, describe the **/etc/group** file under the following headings:

    i. What is its purpose?
    ii. What does it contain?

(3 marks)

d) Describe the steps involved in the procedure of adding a new user to a Linux system. Your answer should include a description of:

    i. the steps required by the system
    ii. the steps that establish a useful environment for the new user, and
    iii. the steps needed for the convenience of the administrator

(9 marks)

(30 Marks Total)

Question 5

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)