



Academic Year: 2007 - 2008
Examination Period: January 2008
Module Leader: Nigel Gunton
New Module No: UFEEHX-20-2
Old Module No:
Title of Module: Computer Networks and Operating Systems
Examination Date:
Examination Start time: 09:00
Duration of Examination: 2 Hour(s) 00 Minutes

Instructions to Students: Attempt all of Section One and any 1 question from Section Two

Materials supplied to the student will be:

Number of Examination Booklets (+ any continuation booklets as required) per Examination	1
Number of Pre-printed OMR (Multiple Choice Answer Sheet)	0
Number of sheets of Graph Paper size G3 (Normal)	0

Additional Instructions to Invigilators:

Calculators may be used subject to University regulations	Yes
Students allowed to keep Examination Question Paper	Yes
Material supplied by student allowed :	No
Additional Specialised Material:	

Treasury tags & adhesive triangles will be supplied as standard

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SECTION ONE

Attempt all questions in this section.

- 1) A **Process control block** is a data structure whose fields contain all the information needed to manage a process. List at least 10 of the fields needed for such a data structure. A short comment must identify the purpose of each field in your structure.
(5 Marks)
- 2) With respect to a typical Unix system, briefly explain the circumstances under which a running process might get switched out from the CPU. Your answer should include reference to the queues on which the process might get placed.
(5 Marks)
- 3) Explain how Unix systems such as GNU/Linux identify the type of file or device to the user and how this differs from operating systems such as Microsoft XP
(5 Marks)
- 4) Within the context of operating systems, explain the following terms :
 - a) Mutual Exclusion.
 - b) Starvation.
 - c) Deadlock.(5 Marks)
- 5) Unix style file systems use a data structure called an `inode` to hold information about a file. Provide 5 examples of such information from the 'on-disk `inode`' and 5 examples of the additional information stored in the 'in-memory `inode`'
(5 Marks)

SECTION TWO

Answer any one question from this section.

6)

- i) Decisions have to be made when partitioning a disk drive prior to installing GNU/Linux. Explain
- why you might want to create several partitions and which parts of the file system might have their own partitions. (7 Marks)

 - the purpose of the swap partition and the role that it plays in process management. (4 Marks)

 - what might affect your choice of block size when using an ext2 filesystem. (4 Marks)
- ii) Answer the following with respect to either
- a) an office administrator
or
 - b) a software developer

When installing GNU/Linux for one of the above you will need to make decisions regarding the

- partitioning,
- file system type,
- users,
- software, etc

in order to make sure that you have only the required packages and utilities installed. Describe the decisions that you would make for your chosen installation and justify them. (8 Marks)

7) Scheduling, the method by which a process is selected for running on a cpu, involves a number of factors. Answer the following within this context.

i) Scheduling algorithms can be classified into three groups

- Preemptive
- Non-Preemptive
- Cooperative

Describe each of these and explain in each case under what circumstances a process can be rescheduled or will give up the cpu.

(10 Marks)

ii) In the Linux 2.4 kernel processes can be scheduled according to one of the following policies; `Sched_FIFO`, `Sched_RR` and `Sched_Other`. Explain how each works and suggest which kind of processes might use each algorithm.

(8 Marks)

iii) The management of process priority queues was radically changed for the the Linux 2.6 kernel. Briefly describe the advantages of this change and with the aid of diagrams show how this is structured.

(7 Marks)

8) Memory Management is an important component of modern operating systems, enabling multiple processes to share physical memory. To do this it may make use of both a segmented memory model and a paged memory model.

i) Describe, with the aid of diagrams, each of these memory models, their advantages and their disadvantages and the way that GNU/Linux combines these models.

(10 Marks)

ii) Pages sometimes need to be removed from memory in order to make space for another processes pages. There are a number of different algorithms that could be used, these include the FIFO, modified FIFO and NRU algorithms. Describe how these three work, along with any advantages or disadvantages.

(15 Marks)