



INSTITUTE OF TECHNOLOGY TRALEE

Semester 2 Examination 2010

Operating Systems (CRN 43834)

Internal Examiners: Ms. Cathryn Casey
External Examiner: Mr. Andrew Beatty

Duration: 2 Hours

Instructions to Candidates: Answer **any THREE** Questions.
All questions carry equal marks.

Question 1. Process Management

(a) For each of the following transitions between process states, indicate whether or not the transition is possible. If it is possible, give an example of one thing that would cause it. If it is not possible, give a reason.

- (i) running -> ready
- (ii) running -> blocked
- (iii) blocked -> running
- (iv) blocked -> ready
- (v) ready -> running
- (vi) running -> terminated

(18 marks)

(b) Write notes on the following:

- (i) program counter
- (ii) instruction register
- (iii) performing I/O with interrupts
- (iv) context switch
- (v) process control block (PCB)

(15 marks)

Question 2. CPU Scheduling

Note: assume here that there is a single CPU.

(a) The operating system maintains a queue of ready processes from which it selects the next process to be executed. But this queue may not operate as a first-in, first-out queue. For each of the following scheduling algorithms, state whether the queue is a first-in, first-out queue. Explain your answer in each case.

- (i) FCFS (First-Come, First-Served)
- (ii) Shortest-Job-First
- (iii) Priority

(9 marks)

(b) The following table shows the arrival and burst times of 4 processes:

Process	Arrival Time	Burst Time
P1	0	8
P2	1	12
P3	3	4
P4	6	3

Draw Gantt charts for each of the following scheduling algorithms:

- (i) FCFS (First-Come, First-Served)
- (ii) Nonpreemptive SJF (Shortest-Job-First)
- (iii) Preemptive SJF (also called Shortest-Remaining-Time-First (SRTF))
- (iv) Preemptive Priority. The processes have priorities 3, 2, 1, 4 respectively. Note: the smaller the integer the higher the priority.

For each algorithm give the waiting time of each process and the average waiting time. State which algorithm produces the best results for waiting times. Explain why this is so.

(24 marks)

Question 3. Memory Management

(a) Paging is one method that can be used to allocate memory.

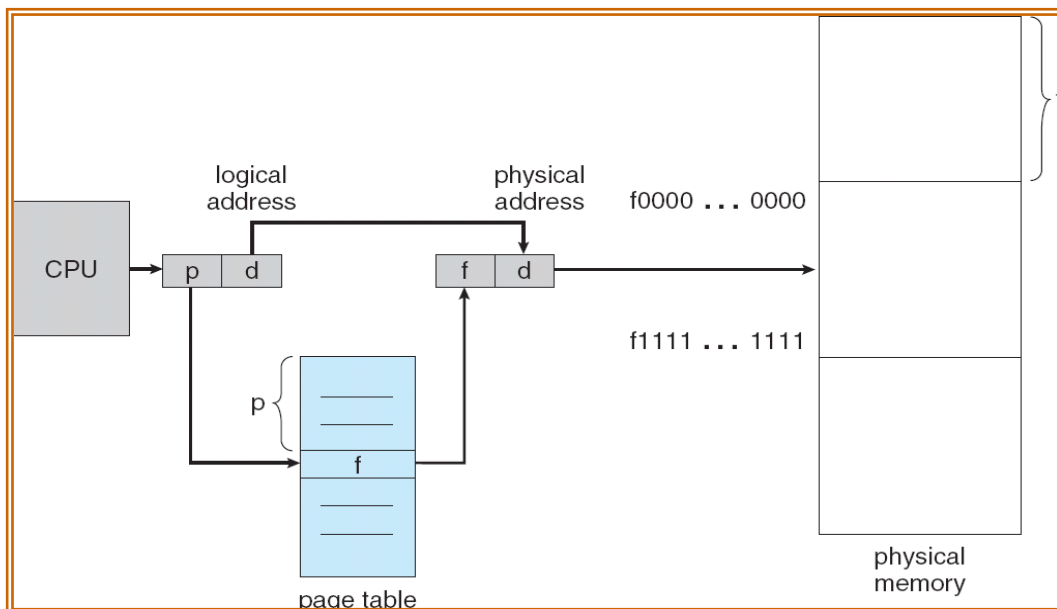
(i) Describe this method. In your answer, include an explanation of the following terms: frame, page, page table, internal fragmentation. **(10 marks)**

(ii) The following is a sample page table for a process. Explain what this tells you about the logical address space and the physical address space for the process. Give a diagram to show the physical memory for this process.

0	1
1	4
2	3
3	7

(8 marks)

(iii) The following diagram shows the hardware used in paging. Describe how a logical address is mapped to a physical address. **(8 marks)**



(b) Virtual memory can be implemented using demand paging. Explain what is meant by demand paging. **(7 marks)**

Question 4. Linux

(a) Assuming you are in your home directory initially, give the commands to do the following:

- (i) create an empty file called myfile1
- (ii) make a new directory called mydocuments
- (iii) move myfile1 to mydocuments
- (iv) change to mydocuments directory
- (v) list the files in the mydocuments directory
- (vi) make a new directory in mydocuments called mypictures
- (vii) copy myfile1 to mypictures

(14 marks)

(b) Assuming you are in your home directory initially i.e. /home2/t00012345 and that it contains a directory called myfiles

Give the command to change to myfiles directory using (i) absolute pathname and (ii) relative pathname.

(4 marks)

(c) The following is one of the lines of output from the `ls -l` command:

```
-rwx----- 1 t00012345 students 4096 2010-01-22 15:30 datafile
```

Explain the meaning of `rwX-----` in this output. Give the command to give all users read access to this item.

(6 marks)

(d) The following is one of the lines of output from the `ps aux` command:

USER	PID	%CPU	%MEM	VSZ	RSS	TTY	STAT	START	TIME	COMMAND
15079	2751	1.2	0.3	74424	13280	?	S	12:47	0:05	gnome-terminal

Explain the meaning of any 4 items of information in this output.

(9 marks)