INSTITUTE OF TECHNOLOGY TRALEE

SUMMER EXAMINATIONS 2011/2012

Operating Systems

Module Code: COMP 61008
CRN: 43834

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Internal Examiner: Cathryn Casey **Duration: 2 Hours**

Instructions to Candidates: Answer **any THREE** questions.
All questions carry equal marks (33 marks)

Question 1. Process Management

Note: assume here that there is a single CPU.

(a) What is the difference between a program and a process? **(4 marks)**

(b) The program counter is a register in the CPU. What is the function of this register? **(4 marks)**

(c) The 3 states of a process are running, blocked and ready. Describe each of these states. **(6 marks)**

(d) Give a diagram to illustrate process state transitions. Describe each possible transition that can occur. **(13 marks)**

(e) One method of performing input/output is with interrupts. Another method is busy waiting. An advantage of using interrupts over busy waiting is that the CPU is not tied up. Briefly explain why. **(6 marks)**

Question 2. Scheduling

(a) The CPU scheduler and the Dispatcher module are parts of the operating system. Give a brief description of the function of each. **(6 marks)**

(b) Two criteria used in scheduling algorithms are turnaround time and waiting time. Describe each of these. **(4 marks)**

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

Process	Arrival Time	Burst Time
P1	0	3
P2	1	6
P3	4	4
P4	5	2

Draw Gantt charts for each of the following scheduling algorithms

- FCFS
- Nonpreemptive SJF (Shortest-Job-First)
- RR (Round-Robin) (quantum = 3)

For each algorithm give the waiting time and turnaround time of each process
(23 marks)

Question 3. Memory Management

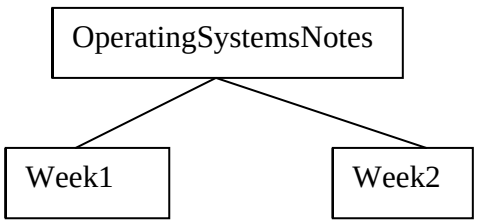
(a) Three types of memory are: CPU registers, Cache and Main memory.
(i) Order these in terms of speed of access – fastest first. **(2 marks)**
(ii) What is the function of the CPU registers? **(3 marks)**
(iii) Cache sits between CPU and Main memory. Describe what Cache is used for.
(4 marks)

(b) 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, free-frame list, internal fragmentation. **(13 marks)**

(ii) Assume the free-frame list is 16, 17, 10, 25, 7, 22, 10.
A new process has 5 pages. Describe how memory is allocated to this new process.
What are the contents of the free-frame list after allocation? Give a diagram to show where in memory the new process is located. Also give the contents of the page table for the new process. **(11 marks)**

Question 4. Linux

(a) Below is a diagram of a directory structure:



(i) Give the commands to create this structure. Assume you are in your home drive initially i.e. /home2/t00012345 and that OperatingSystemsNotes directory should be placed there. **(6 marks)**

(ii) The following files are in your home directory: ProcessNotes and LinuxNotes. Assuming you are in the home directory initially, give commands to:

- copy ProcessNotes into Week1 directory.
- remove ProcessNotes from your home directory
- copy LinuxNotes to Week2 directory **(6 marks)**

(b) Explain the difference between absolute and relative pathnames. Give examples to illustrate your answer. **(6 marks)**

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

drwx------ 1 t00012345 students 4096 2012-01-20 14:00 test

(i) How do you know that test is a directory and not a file? **(2 marks)**

(ii) Who owns this directory? **(1 mark)**

(iii) Who is the group owner of this directory? **(1 mark)**

(iv) Explain the meaning of rwx------ in this output. **(6 marks)**

Assume the following command is given:
chmod g+rwx test

(v) What changes does this command make to the permissions on test? **(3 marks)**

(vi) What changes would this command make to the output from the ls-l command? **(2 marks)**