INSTITUTE OF TECHNOLOGY TRALEE

SUMMER EXAMINATIONS AY 2012-2013

Operating Systems

Module Code: **COMP 61008**
CRN: **43834**

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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? **(3 marks)**

(b) Three processes, A and B and C are in memory. Process A is in memory locations 4000 to 4100. Process B is in memory locations 5500 to 5900. Process C is in memory locations 6000 to 6200.
The Operating System dispatcher/scheduler is located at memory address 100 and it contains 5 instructions.

(i) Draw a diagram to illustrate the contents of memory. **(4 marks)**

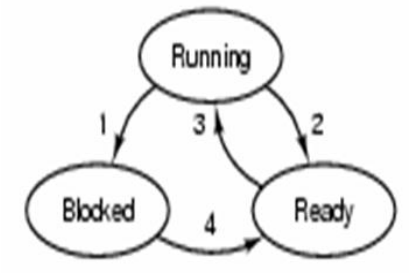
Processes are queued in the order A, B, C. Round-robin scheduling is used and the time quantum is 10 instruction cycles. Process A requests an I/O action, for which it must wait, after 13 instructions are executed.

(ii) Show a trace of this system for 60 instruction cycles. **(12 marks)**

The following are the first few lines:

Instruction Cycle Number	Instruction address
1	4000
2	4001
…	...
10	4009

(c) The diagram given below illustrates process state transitions.



(i) Describe each of the four possible state transitions. **(8 marks)**

(ii) Specify where on the trace for (b) (ii) above, one example of each of the transitions 1, 2 and 3 occurs. In each case, state which process is changing state. **(6 marks)**

Question 2. Scheduling

(a) The CPU scheduler is part of the operating system. Give a brief description of the function of the scheduler. **(3 marks)**

(b) Explain the difference between preemptive and nonpreemptive scheduling. **(4 marks)**

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

Process	Arrival Time	Burst Time
P1	0	8
P2	2	4
P3	4	5
P4	5	2

Draw Gantt charts for each of the following scheduling algorithms

- FCFS
- Nonpreemptive SJF (Shortest-Job-First)
- Preemptive SJF (also called Shortest-Remaining-Time-First (SRTF))

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

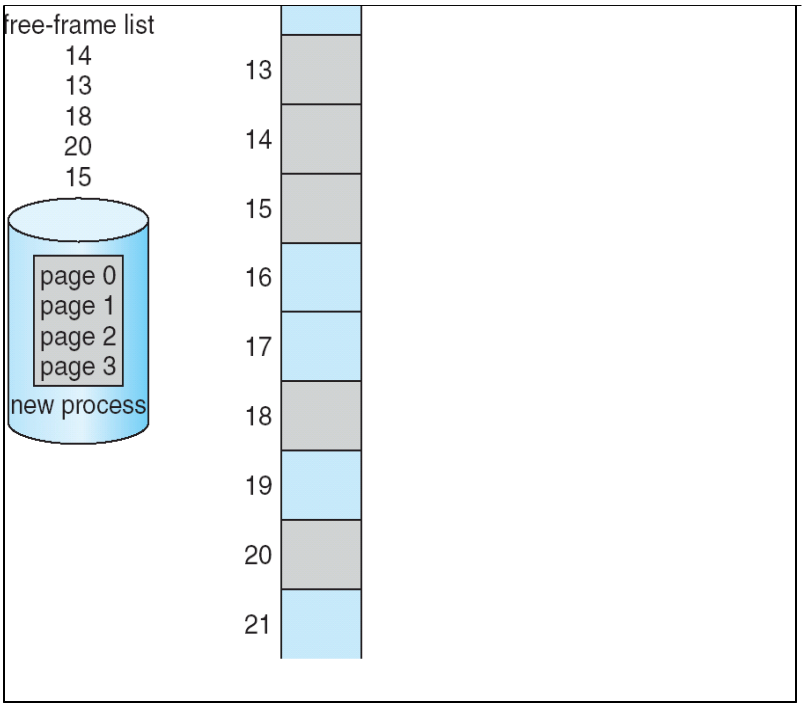
(d) State whether FCFS scheduling algorithm is preemptive or nonpreemptive. Explain your answer. **(3 marks)**

Question 3. Memory Management

(a) Contiguous Allocation is one method that can be used to allocate memory.
(i) Describe this method by explaining what happens when a new process arrives to be executed.
Use diagrams to illustrate your answer.
Assume First-fit is the method used to allocate memory i.e. allocate the first unused block of memory that is big enough. **(10 marks)**

(ii) External fragmentation can occur with contiguous allocation. Describe how this occurs. **(5 marks)**

(b) Paging is another method that can be used to allocate memory whereby the memory occupied by a process is noncontiguous. The following diagram shows the free frame list and the memory frames before a new process is allocated memory. The new process has 4 pages.
(i) Describe how memory is allocated to this new process and give a diagram to show the free frame list and the contents of memory after allocation. Also give the contents of the page table for the new process. **(13 marks)**



(ii) Internal fragmentation can occur with paging. Describe how this occurs.
(5 marks)

Question 4. Linux

(a) Assuming you are in your home directory initially and that it has a file called myfile1, give the commands to do the following:

(i) Show who you are currently logged on as
(ii) display the contents of myfile1 on the screen
(iii) create an empty file called myfile2
(iv) make a new directory called mydocuments
(v) move myfile1 to mydocuments
(vi) change to mydocuments directory
(vii) print the path name of the current directory.
(viii) list the files in the current directory
(ix) make a new directory in mydocuments called mypictures
(x) copy myfile2 to mypictures **(20 marks)**

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

-rwxrw-rw- 1 t00012345 students 4096 May 22 14:30 testfile
Explain the meaning of rwxrw-rw- in this output. **(6 marks)**

Assume the following command is given:
chmod o-w testfile

(i) What changes does this command make to the permissions on test? **(2 marks)**

(ii) What changes does it make to the output from the ls-l command? **(2 marks)**

(iii) Give the command to give full access rights to the group. **(3 marks)**