GRIFFITH COLLEGE DUBLIN

Class Test

OPERATING SYSTEMS DESIGN

Lecturer: **Dr Faheem Bukhatwa**

Date: April 2018

Maximum time: 75 minutes.

ALL QUESTIONS TO BE ATTEMPTED.

ALL QUESTIONS CARRY EQUAL MARKS .

Answer all questions:

(1) Explain how spooling could improve performance.

(2) Use a diagram and at least six statements to explain the basic idea of the paged memory allocation system.

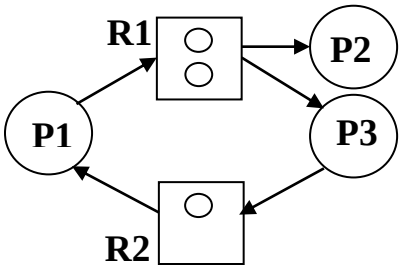
(3) Explain the effect of very short and very long Quantum length on performance.

(4) The following table shows the burst times of 4 processes. The sequence of their arrival is: P1 then P2 then P3 then P4.

Process	Burst Time in ms
P1	3
P2	6
P3	4
P4	3

Draw Gantt Charts (time chart) and show average turnaround time for each of the FCFS scheduling algorithm.

(5) Explain if the system is deadlocked or not in the following directed resource graph.

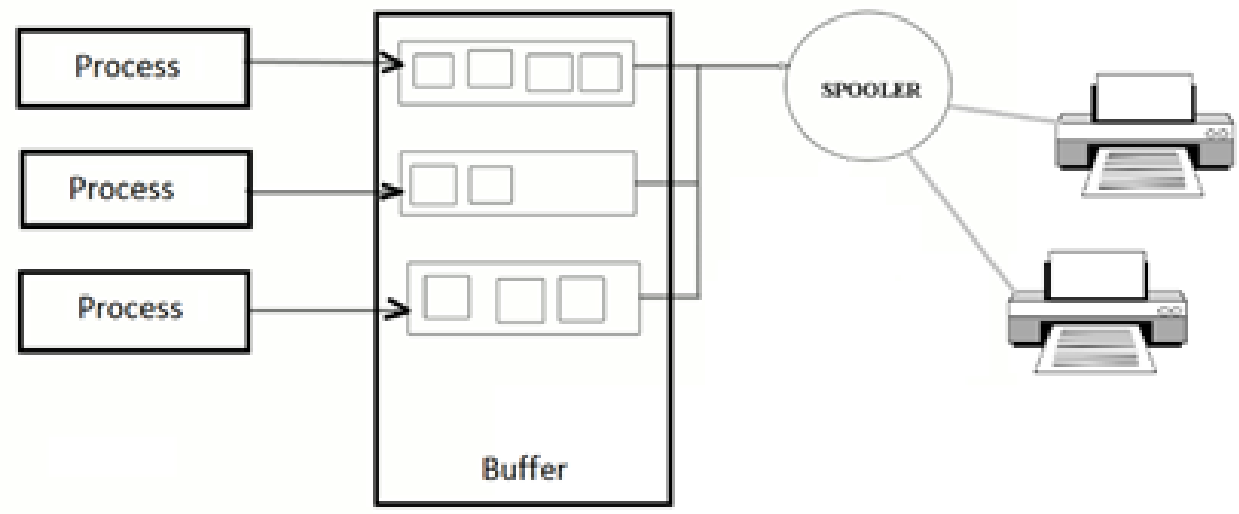


(1) Explain how spooling could improve performance.

Spooling stands for: Simultaneous Printing Operation On Line. A technique used to convert dedicated devices into virtual devices. It uses buffer in main memory.

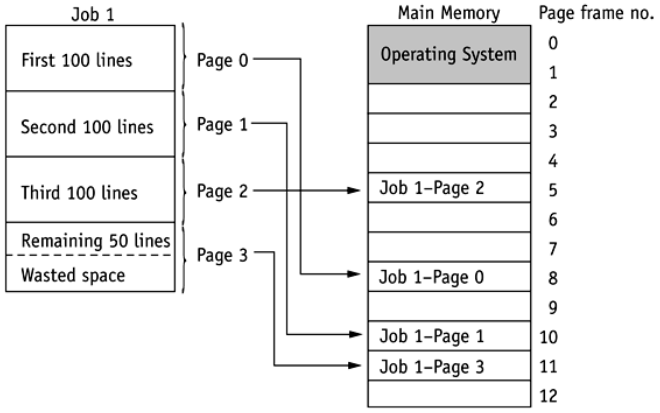
- Dedicated devices that have been transformed into shared devices
  - e.g., printers (dedicated devices) converted into sharable devices through a spooling program
- Spooling is used to speed up slow dedicated I/O devices
  - e.g., USB controller, a virtual device that acts as an interface between OS, device drivers, and applications and the devices that are attached via the USB host

One of the earliest applications of multiprogramming spooling gives the ability to avoid delays caused by slow speed devices such as terminals, printers etc.
For input, the OS reads data from the slow input device, stores it to a fast device or to a buffer in memory. Any further requests of input the OS takes the data from the buffer.
On output, data is written to fast media or a buffer in memory enabling the program to believe it is finished and exit allowing the OS to load and execute another process. The output is then processed from the buffer to the final output device, (typically a printer). Hence, one process can be executing while the printer is printing the output of a previous process.



(2) Use a diagram and at least six statements to explain the basic idea of the paged memory allocation system.

1. Divides memory into equal size blocks called page frames
2. Divides each incoming job into pages of equal size
3. Page size is the same as memory block size (page frames).
4. Before executing a program, Memory Manager:
5. Determines number of pages in program and locates enough empty page frames in main memory
6. Loads all of the program's pages into them
7. The full program is loaded into memory but in a non-contiguous space



(3) Explain the effect of very short and very long Quantum length on performance.

- Very short quantum leads to:
  1. A lot of context switching. To the point that more process context switching is done than processing.
  2. This produces short response time
  3. Suitable for interactive systems.
  4. Fair in CPU use. Good for short jobs.
  5. CPU utilization decreases
  6. Shorter average turnaround time.
- Very long quantum leads to:
  1. No or very little context switching.
  2. Long jobs are not interrupted, which means the system turns into a FCFS.
  3. This produces long response time, reduces the interactive property of the system.
  4. Short jobs suffer behind a long job
  5. Longer average turnaround time
  6. CPU utilization improves

(4) The following table shows the burst times of 4 processes. The sequence of their arrival is: P1 then P2 then P3 then P4.

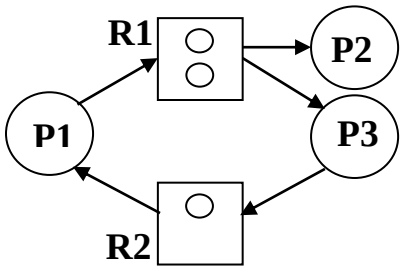
Process	Burst Time in ms
P1	3
P2	6
P3	4
P4	3

Draw Gantt Charts (time chart) and show average turnaround time for each of the FCFS scheduling algorithm.

Burst times	3	6	4	3
Turnaround times	3	9	13	16

Average turnaround time = (3 + 9 +13 +16) / 4 = 41/4 = 10.25 ms

(5) Explain if the system is deadlocked or not in the following directed resource graph.



An instance of R1 is allocated to P2.
P2 has all resources it needs. It will finish it releases R1

An instance of R1 is allocated to P1 and
P1 has all resources it needs. It will finish it releases R1 and R2
.

R2 is allocated to P3.
P3 has all resources it needs. It will finish it releases R1 and R2

No, there is no deadlock.

(6) Explain how internal fragmentation and external fragmentation happen in dynamic partitioning memory systems.

Internal fragmentation **does not** happen in dynamic partitioning memory systems because each process is allocated exactly its needs of memory.

External fragmentation happens as when for example a process needs 49 k memory and it is allocated from a 50 k memory block. The remaining 1 k of memory is external fragmentation.