2007 Operating System Midterm (CLD)

1. Explain following terms: (Please "Draw the figures or give an example" that can illustrate the following terms)
   1. Thrashing (5%)
   2. Critical section (5%)
   3. Starvation (5%)
   4. RAID (5%)
   5. Optimal page replacement algorithm (5%)
   6. Paging memory scheme (5%)
2. Propose two approaches to protect files in a file system. (5%)
3. The system will enter deadlock if you cannot find a safe sequence for it, YES or NO? Please draw a diagram to explain your answer. (5%)
4. Please list the four necessary conditions when the deadlock occurs. (10%)
5. Please describe the six-step process in a DMA transfer
   1. Draw the architecture of a DMA transfer. (12%)
   2. Explain each step of the DMA transfer in details with the figure you draw. (8%)
6. Suppose that a disk drive has 1200 cylinders, numbered from 0 to 1199. The drive is currently serving a request at cylinder 250, and the previous request was at cylinder 110. The queue of pending request, in FIFO is

Starting from the current head position, what is the total distance (in cylinders) that the disk arm moves to satisfy all the pending request for each of the following disk scheduling algorithms? Please draw the figure that how disk arm moves for each scheduling algorithm and calculate the total distances that disk arm moves for each algorithm.

* 1. FCFS (5%)
  2. LOOK (5%)
  3. C-LOOK (5%)
  4. C-SCAN (5%)

1. There are 3 page frames. We consider following reference string:

Use "FIFO" and "LRU" page replacement to replace pages. "Draw the table" to note the steps you did by using each replacement, and "Count the number of page faults" for each replacement. (10%)

# Answers

* 1. 因為 process 沒有分到足夠的 frame，因此會常常 page fault 而使得 CPU 使用率低，OS 試圖調高degree of multiprogramming 來提高CPU使用率，但反而因為 process 增加，每個 process 分到的frame 更少，CPU 使用率更低，惡性循環。  
     Total size of locality > total memory size.
  2. 當一個 process 在 critical section 時，其他 processes 不能也在 critical section，必須等待。
  3. Process 因為長期無法取得所需資源，導致無法完成工作、indefinite blocking。
  4. Redundant Array of Independent Disks，透過 redundancy 提供硬碟的 reliability。
  5. 取代最長時間才需要再次使用或是永遠不會用到的 page。
  6. 使虛擬記憶體配置可以是不連續的，將 process 配置到任何可使用 (available) 的不連續實體記憶體。
  7. File owner/creator should be able to control:
     1. what can be done
     2. by whom
  8. Types of access
     1. Read
     2. Write
     3. Execute
     4. Append
     5. Delete
     6. List

1. No, 因為找不到 safe sequence 只是會進入 unsafe state，卻不一定會進入 deadlock。

