CS307 Operating System Exercises Spring 2020

Exercise 4

Due date: 12:30PM, Apr. 23, 2019

1. Consider a single level paging scheme. The virtual address space is 256 MB and page table entry size is 4 bytes. What is the minimum page size, such that the entire page table fits well in one page?

2. Consider six memory partitions of size 200 KB, 400 KB, 600 KB, 500 KB, 300 KB, and 250 KB. These partitions can be allocated to four sequentially arrived processes with sizes of 357 KB, 210 KB, 468 KB, and 491 KB. Perform the allocation of processes using
   1) First Fit Algorithm
   2) Best Fit Algorithm
   3) Worst Fit Algorithm

3. Consider a system using multilevel paging scheme. The page size is 1 MB. The memory is byte addressable and virtual address is 64 bits long. The page table entry size is 4 bytes.
   1) How many levels of page table will be required?
   2) Please give the structures of physical address and virtual address.

4. A system uses 3 page frames for storing process pages in main memory. It uses the
   1) First in First out (FIFO) page replacement policy
   2) Least Recently Used (LRU) page replacement policy
   3) Optimal page replacement policy

   Assume that all the page frames are initially empty. What is the total number of page faults that will occur while processing the page reference string given below?

   4, 7, 6, 1, 7, 6, 1, 2, 7, 2

   Please also calculate the hit ratio and miss ratio.

5. Consider a two level paging scheme with a TLB. Assume no page fault occurs. It takes 20 ns to search the TLB and 100 ns to access the physical memory. If TLB hit ratio is 80%, what is the effective memory access time?

6. Consider a disk queue with requests for I/O to blocks on cylinders 23, 89, 132, 42, 187. The head is initially at cylinder number 100. Assume we are going inwards (i.e., towards 0). The cylinders are numbered from 0 to 199. Calculate the total head movement (in number of cylinders) incurred while servicing these requests. Please apply FCFS, SSTF, SCAN, C-SCAN, and C-LOOK, respectively.