CSCI-411 Operating System Fundamentals

Sample Test 2

Name: ____________________

Email Address: ____________________

This is a open book, open notes exam. You have 90 minutes to answer as many questions as possible. The number in parenthesis at the beginning of each question indicates the number of points given to the questions Write all your answers directly on this paper. Make your answers as concise as possible.

Problem	Points Scored	Points Possible
1	____	20
2	____	20
3	____	20
4	____	20
5	____	20
6	____	20
Total		

1. (20 points) Indicate whether each of the statements below is True(**T**) or False(**F**).

______	(a)	"Dirty" Pages mean the pages got abused while using them.
______	(b)	Virtual addresses of variables are calculated at compile time.
______	(c)	If you have more frames, then you will always have less page faults.
______	(d)	A linker resolves library references.
______	(e)	Page sizes are usually powers of 2.
______	(f)	Page tables are always stored in primary storage.
______	(g)	Virtual memory is usually smaller than physical memory.
______	(h)	LIFO page replacement strategy is an example of a stack algorithm.
______	(i)	MIN page replacement strategy suffers from Belady's anamoly.
______	(j)	An executable program resides on a remote node. Would it be better to copy the entire image to the local space before executing it.
______	(k)	File access time in disk is independent of the disk head position.
______	(l)	Input and Output are done in blocks for increased efficiency.
______	(m)	Each process is given equal amount of storage all the time.
______	(n)	Inverted page table maps frames to pages.
______	(o)	Page fault decreases the effective access time.
______	(p)	If the user program modules use the principle of locality, then thrashing will be less.

(2a) (10 points) Given the memory partitions of 100K, 500K, 200K, 300K and 600K i(in order), how would each of the First-fit, Best-fit and Worst-fit algorithms place processes of 212K, 417K, 112K, and 426K (in order)? Which algorithm makes the most efficient use of memory?

(2b) (10 points) An operating system supports a paged virtual memory, using a central processor with cycle time of 1 microsecond. It costs an additional to access a page other than the current one. Pages have 1000 words, and the paging device is a device that rotates 3000 revolutions per minute, and transfers 1 million words per second. The following statistical measurements were obtained from the system:

- 1% of all instructions executed other than the current page.
- Of the instructions that accessed another page, 85% accessed page already in memory.
- When a new page was required, the replaced page was modified 50% of the time.
- Drum can rotate in either direction.

Calculate the effective instruction time on the system, assuming that the process is running one process only, and the process is idle during drum transfers.

(3a) (5 points) Construct an example free list and memory requests in which

- "best fit" algorithm is unable to satisfy a request - even though there is enough memory - but they are fragmented.
- "first fit" algorithm is unable to satisfy a request - even though there is enough memory - but they are fragmented.

(3b) (10 points) As a systems programmer in a large computer installation using a fixed partition multiprogramming system, you have been given the task of determining if the current partitioning of the system should be altered.

- What information would you need to help you make your decision?
- If you had this information readily available, how would you determine the ideal partitioning?
- What are the consequences of repartioning such a system?

(3c) (5 points) Consider a logical address space of 32 pages of 8192 bytes each, mapped onto a physical memory of 128 frames. (in a byte addressable computer) (frame size = page size)

1. How many bits are there in the logical address?
2. How many bits are there in the physical address?

(4a) (15 points) Do problem 11.1 of Silberschatz and Galvin.

(4b) (5 points) Why must the bit map for the file allocation be kept on mass storage instead of main memory?

(5a) (10 points) Consider the following page reference string:
2,3,2,1,5,2,4,5,3,2,5,2
How many page faults would occur for the following replacement algorithms, assuming three page frames. Assume all frames are initially empty.

- LRU replacement
- FIFO replacement
- MIN replacement
- CLOCK replacement

(5b) (5 points) Unix files are created empty, without specifying how large they may grow. What would gained by knowing the eventual maximum size of a file when it is created. Suggest a scheme for allocation of space to UNIX-like files as they grow.

(5c) (5 points) How do you create a directed acyclic graph structure for directories and file systems in UNIX? (what is the UNIX command). List the advantages and disadvantages of the graph structure.

(6) (20 points) Write a monitor type program for disk scheduling using the SCAN disk-scheduling algorithm.