

CMSC 412 Final (Spring 2014)

Name _____

Signature _____

- (1) This exam is closed book, closed notes, and closed neighbor.
- (2) You have 110 minutes to complete this exam. If you finish early, you may turn in your exam at the front of the room and leave. However if you finish during the last ten minutes of the exam please remain seated until the end of the exam so you don't disturb others.
- (3) Write all answers on the exam. If you need additional paper, I will provide it. Make sure your name is on any additional sheets.
- (4) Partial credit will be given for most questions assuming I can figure out what you were doing.
- (5) Please write neatly. Print your answers if your handwriting is hard to read. If you write something, and wish to cross it out, simply put an X through it. Please indicate if your answer continues onto another page.
- (6) Cell phones must be turned off (not just vibrate) during the exam. A cell phone ringing during the exam will result in 10 points being deducted from your score.

Question	Possible	Score
1	30	
2	25	
3	30	
4	25	
5	15	
6	25	
Total	150	

1.) (30 points) Define (or explain) the following terms:

a) Ethernet MAC Address

b) Mutual Authentication

c) Mutual Exclusion

d) CR3

e) Segmentation (compared to paging)

2.) (25 points) Processes

- a) List at least one thing that must be done when using each process creation choice listed that is not required when doing either of the other two:

Fork:

Spawn:

Clone:

- b) Give an example when a scheduling algorithm might want to let a process run for 100usecs precisely every 10 msec.
- c) List two options of what can happen when a parent process is terminated before all of its children.

- 3.) (30 Points) Synchronization: Implement a Hybrid Lock/Unlock pair that will spin up to 1,000,000 times and if the lock can't be obtained, will then use a binary semaphore to block the calling process. You may assume that you have the following primitives:

Swap(a,b) atomically swaps two variables

P(sem) performs a P operation on a semaphore

V(sem) performs a V operation on a semaphore

```
Typedef struct { // insert your fields here
```

```
} HybridLock;
```

```
Lock(HybridLock *l) {
```

```
Unlock(HybridLock *l) {
```


- 5.) (15 points) Memory & the project: Currently the GeekOS system does not allow for malloc by user processes. Explain would you need to add to the kernel and user library to support malloc. In normal use, most calls to malloc/free should not result in kernel calls.

6.) (25 points) Disks

- a) List three things that would need to change in project #5 (CFS) to move to an extend-based file system that supported pre-allocation.

- b) Show the completion time of each of the disk requests using the three algorithms listed. Assume that once the disk head starts to move, any request that arrives will not be considered until the pending seek completes. It takes one unit of time to seek one sector and the head starts at sector 0.

Arrival Time	Track Requested	FCFS	Shortest Seek First	Circular Scan
0	10			
5	5			
7	18			
10	16			