

CMSC 412 Final (Fall 2011)

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.

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) Public Key Encryption (Cypher)

c) Bankers Algorithm

d) Mechanism vs. Policy

e) Inverted Page Table

3.) (30 Points) Synchronization: You need to synchronize the process of getting and making coffee in a restaurant. In the restaurant, there are stations around the restaurant each with a coffee urn (all coffee is regular at this establishment). If wait staff go to get a cup of coffee at a station, and that urn is empty they take the urn to the kitchen to make more coffee. In the kitchen is a machine that can make two urns of coffee at once. Provide a solution using semaphores (include variable declarations and initial semaphore values) to the coffee problem that ensures:

- Only one wait staff at a time is taking coffee out of each urn
- At most two urns are on the coffee maker at a time
- Each wait staff member is assigned an area of the restaurant and so will only get coffee from one station. Each wait staff member has a thread local variable `myStation` that tells them the integer number (0 to n-1) of the coffee station they should use.
- If coffee is available at the station the wait staff goes to, they can get coffee even if coffee is being made.
- If no coffee is available and someone else is making it, wait staff wait at the station for the re-filled urn to appear.
- After getting one cup of coffee, wait staff immediately try to get more.

Wait Staff:

```
While (1) {
```


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?

6.) (25 points) Disks

a) Give two reasons why one initial use of solid state disks might be to use them as a cache between the file buffer cache and magnetic (spinning) storage.

b) Given a drive with that spins at 7200 RPM and has an average seek time of 3ms. If rotational latency and seek time are the only components of access time, what is the average access time to a random sector? Show your calculations.