CMSC 412 Midterm #1 (Spring 2014)

Name _____   Signature _____

(1) This exam is closed book, closed notes, and closed neighbor. No calculators are permitted. Violation of any of these rules will be considered academic dishonesty.

(2) You have 70 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. Failure to follow this direction will result in points being deducted from your exam.

(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 deduced from your score.

Question	Possible	Score
1	**20**	
2	**20**	
3	**16**	
4	**12**	
5	**12**	
6	**20**	
Total	**100**	

1.)   (20 points) Define and explain the following terms:

   a)   Proportionality Principle

   b)   Process Control Block (PCB)

   c)   CPU protection

   d)   Critical Section

2.)   (20 points) Given a system that provides binary semaphores (semaphores whose values is either
        0 or 1). Show the code to implement counting semaphores using binary semaphores.

P:

V:

3.)   (16 Points) Scheduling

a)   Given a round robin scheduler (with a quantum of 1 unit), and the following jobs, indicate when each job completes. When a job arrives at time n, it is placed at the head of the queue of processes and can first run at time n+1.

Job	Arrival Time	Required Time	Completion Time
A	0	6	
B	3	3	
C	6	6	
D	15	2	

b)   If a scheduler moves processes to a lower priority queue if they use their full quantum, describe a counter strategy for this policy that a process could use to prevent getting put at lower priority.

4.)   (12 points) Deadlock: Explain the four necessary conditions for deadlock.

5.)   (12 points) Why do we use an interrupt/trap instruction and a number to call a system call rather than simply making it a procedure call?

6.)   (20 points) In project #2, another way to handle signal delivery and signal completion is to have the kernel set the EIP to a **standard** signal processing function in user space (in libc) and have that libc function call the user's signal handler and then return to the kernel upon completion.

a)   How would the Signal function and system call need to change to handle this model?

b)   How would setup frame need to be changed for this?

c)   How would Sys_RegDeliver need to change?