

CMSC 412 Midterm #1 (Spring 2016)

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 deducted 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) OS Kernel

b) Multi-level feedback queue scheduler

c) Spawn system call (compared to fork)

d) Dispatcher

2.) (20 points) - Synchronization

Given an implementation of general (counting) semaphores, implement bounded counting semaphores where each semaphore is declared with initial values, but also a maximum value. A V operation on a bounded counting semaphore that is at its maximum value should return immediately and not change the state of the system. P works the same as a general semaphore.

CreateBoundedSemaphore(int max, int initialValue):

P_{bounded}

V_{bounded}

3.) (16 Points) Deadlock

a) (7 points) With multiple instances of a resource, why is circular wait only a necessary and not a sufficient condition for deadlock?

b) (9 points) Is this system in a safe state? If so show a safe sequence for it.

Three resources: A, B, C (10, 5, 7 instances each). The snapshot of the system:

	Alloc	Max	Avail	Need
	A B C	A B C	A B C	A B C
P0	0 1 0	7 5 3	3 3 2	7 4 3
P1	2 0 0	3 2 2		1 2 2
P2	3 0 2	9 0 2		6 0 0
P3	2 1 1	2 2 2		0 1 1
P4	0 0 2	4 3 3		4 3 1

4.) (12 points) Policy vs. Mechanism: Circle if the following are policies or mechanisms.

Policy Mechanism Users must change their passwords every 60 days

Policy Mechanism An operating system uses a timer to reclaim the cores from user processes

Policy Mechanism Processes owned by root have higher priority than normal user processes

Policy Mechanism User's files are readable only by that user and their professor

Policy Mechanism An operating system includes semaphore system calls for synchronization

Policy Mechanism A list of runnable processes is stored in a heap

5.) (14 points) Process Manipulation

a) In GeekOS, the kill system call could not call Exit directly. However, the `setup_Frame` code for handling a SIGKILL could call Exit, Why?

b) In GeekOS, why is turning off interrupts (i.e. calling `Disable_Interrupts`) not enough to ensure atomic access to a critical section?

