CS3204 Operating Systems - Fall 2000
Instructor: Dr. Craig A. Struble
Midterm
Length: 75 minutes
Points: 100

Date: Thursday, Oct. 12, 2000 Name: _____

Student ID: _____

This is an open book and open notes test. You may use a calculator. Your answers should be concise and well written. Use scratch paper or the back of the test pages to organize your thoughts before writing an answer. For computational questions, be sure to include intermediate computations. Include any assumptions you make in your answer.

1. *[5 pts.]* Why is a thread also known as a *lightweight process*?

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2. *[8 pts.]* In round robin scheduling, a new process is placed at the end of the ready queue. Suppose that newly created processes are placed at the beginning of the ready queue instead. Can starvation occur? If starvation cannot occur, explain why it cannot occur. If starvation can occur, give a detailed description of when a process will starve.

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3. *[8 pts.]* Suppose you were comparing two timesharing operating systems. Both operating systems support essentially the same virtual memory management, devices, user interface, programmer's interface, etc. The only major difference is that one has a large amount of kernel code and one has a small amount of kernel code. Which operating system would you choose to use and why? Be sure to explain the advantages and disadvantages of each system.

4. *[20 pts.]* Assume you have the following jobs to execute with one processor:

i	$\tau(p_i)$	External Priority
0	20	4
1	50	2
2	40	1
3	35	2
4	10	3

Suppose a system uses a 3 level feedback queue with a time quantum of 15. Further suppose the aging policy from programming assignment 2 is used and that **priority** scheduling (higher number means lower priority) is used to schedule processes in the same level.

a. Create a Gantt chart illustrating the execution of these processes.

b. What is the turnaround time for each process?

c. What is the wait time for each process?

d. What is the average weighted turnaround time?

5. *[10 pts.]* Using the previous problem, suppose that the context switch overhead is 2 time units, where the overhead is the entire cost to switch from one process to the next (i.e., the book's convention). What percentage of the CPU time is used for context switching?

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6. *[12 pts.]* Modern workstations and personal computers support the ability to *mount* filesystems that reside on remote machines (i.e., access the drives over the network).

a. What physical resources are used to mount remote filesystems?

b. What abstract resources are used to mount remote filesystems?

c. Suppose network communication briefly stops while a process is reading a file from a remotely mounted filesystem. What happens to the process assuming that the operating system recovers from the communication stoppage without data loss?

When answering this question, list the most relevant resources involved. A RAM chip or CPU are not the most relevant resources to list, for example. Also, focus on the major concepts taught in class. Do not get overly detailed about the situation.

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7. *[8 pts.]* Suppose a batch system using shortest job next scheduling.

   a. What memory and resource isolation are necessary for such a system and why?

   b. How is CPU isolation implemented?

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8. *[8 pts.]* State which of the following most likely refer to statically set priorities (external) and which refer to dynamically set priorities (internal). Justify your answer.

a. Are easier to implement

b. Require less runtime overhead

c. Are more responsive to changes in a process' environment

d. Require more careful deliberations over the initial priority value chosen

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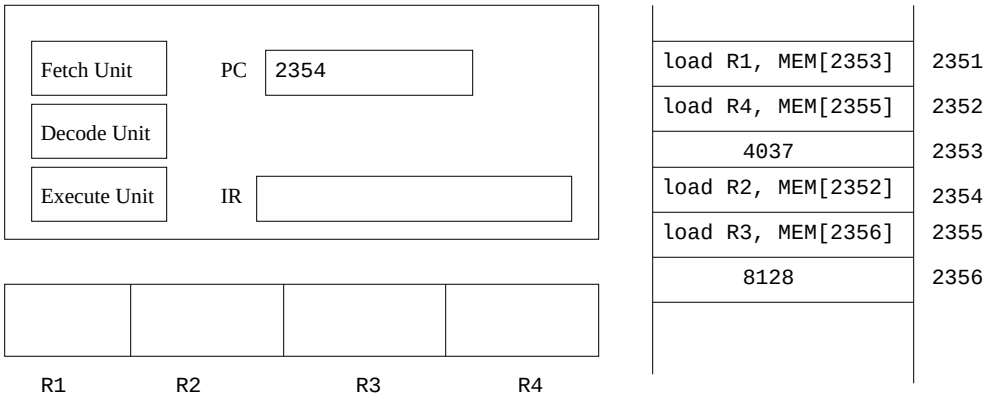
9. *[16 pts.]* Consider the following figure:



a. Starting with the above configuration, assume that we have a complete Von Neumann execution cycle. Fill in the appropriate empty slots above with their respective values.

b. During the Von Neumann execution cycle, the information obtained from memory is intended to be viewed as either an instruction or as data. For each memory transfer that occurred above, provide (i) the **Von Neumann instruction** that initiated that transfer and (ii) tell me how the transferred data is to be viewed.

Instruction	View Transfer Data As

10. *[5 pts.]* Who is going to win tonight's football game?