Brooklyn College, CIS Dept, CIS 25
Midterm Exam

Name: _____

Section: _____ Id.: _____

(*You get 20% credit for leaving an answer blank (1 point for a 5 point question). You get no points for a wrong answer.*)

1. (5 pts) What are the four necessary conditions for a deadlock?

2. (5 pts) What three criteria must a critical section solution satisfy?

3. (5 pts) What are some of the tradeoffs in Round Robin when quantum size is too small or too large?

4. (5 pts) Once you found a deadlock, state at least two ways of handling it? (you already have a deadlock, it's too late to try to avoid it).

5. (5 pts) Provide a deadlock *prevention* algorithm (i.e.: The algorithm must illustrate exactly how to prevent - not avoid - one of the four deadlock conditions).

6. (5 pts) Describe the actions taken by the kernel to context-switch between processes.

7. (10 pts) What are the benefits and the disadvantages of each of the following? Consider both the system level and the programmer level. (q3.5)

    a. Synchronous and asynchronous communication

    b. Automatic and explicit buffering

    c. Send by copy and send by reference

    d. Fixed-sized and variable-sized messages

8. (5 pts) Some computer systems do not provide a privileged mode of operation in hardware. Why *is* it still possible to construct a secure operating system for these computers? And why *isn't* it possible? (q2.6)

9. (5 pts) Show how a system can get into a deadlock using semaphores.

10. (5 pts) What are the five major activities of an operating system in regard to process management? (q3.1).

11. (5 pts) MS-DOS provided no means of concurrent processing. Discuss three major complications that concurrent processing adds to an operating system. (q4.1)

12. (5 pts) Define the difference between preemptive and non-preemptive scheduling.

13. (5 pts) What is the meaning of the term *busy waiting*? What other kinds of waiting are there in an operating system? Can busy waiting be avoided altogether? Explain your answer. (q7.1)

14. (5 pts) Under what conditions would you *not* want to use busy waiting?

15. (5 pts) Give a pseudo-code implementation of `wait` and `signal`. Show that if the `wait` and `signal` operations are not executed atomically, then mutual exclusion may be violated. (q7.7)

16. (20 pts) Five batch jobs, A through E, arrive at a computer center at almost the same time (but in order A through E). They have estimated running times of 13, 3, 7, 5 and 11 minutes. Their priorities are 4, 1, 5, 2 and 3 respectively, with 5 being the highest priority. For each of the following scheduling algorithms, draw a Gantt chart showing the order in which the jobs will run. Then, for each algorithm, determine the average waiting time. Ignore process switching overhead. All jobs are completely CPU bound.

    a. Round Robin (time slice = 3)

    b. Priority scheduling

    c. First-Come, First-Served

    d. Shortest Job First