Operating Systems Course	**Deadline**: March 11, 2008
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1. Redraw Fig. 2-2 adding two new states: New and Terminated. When a process is created, it is initially in the New state. When it exits, it is in the Terminated state.
2. In the text it was stated that the model of Fig. 2-6(a) was not suited to a file server using a cache ***in memory***. Why not? Could each process have its own cache?
3. Show how counting semaphores (i.e., semaphores that can hold an arbitrarily large value) can be implemented using only binary semaphores and ordinary machine instructions.
4. In Sec. 2.2.4, a situation with a high-priority process, H, and a low-priority process, L, was described, which led to H looping forever. Does the same problem occur if round-robin scheduling is used instead of priority scheduling? Discuss.
5. Round- robin schedulers normally maintain a list of all runnable processes, with each process occurring exactly once in the list. What would happen if a process occurred twice in the list? Can you think of any reason for allowing this?
6. Five jobs are waiting to be run. Their expected run times are 9, 6, 3, 5, and X. In what order should they be run to minimize average response time? (Your answer will depend on X.)
7. Five batch jobs A through E, arrive at a computer center at almost the same time. They have estimated running times of 10, 6, 2, 4, and 8 minutes. Their (externally determined) priorities are 3, 5, 2, 1, and 4, respectively, with 5 being the highest priority. For each of the following scheduling algorithms, determine the mean process turnaround time. Ignore process switching overhead.

    - Round robin.
    - Priority scheduling.
    - First-come, first-served (run in order 10, 6, 2, 4, 8).
    - Shortest job first.

For (a), assume that the system is multiprogrammed, and that each job gets its fair share of the CPU. For (b) through (d) assume that only one job at a time runs, until it finishes. All jobs are completely CPU bound

8. Consider four processes namely A, B, C and D according to the following table:

Process	Arrival Time	Time needed to be completed
A	0	3
B	1	3
C	4	3
D	6	3

What's the mean response time for these processes in the case of using FCFS and RR scheduling algorithms? (*Note: suppose that the quantum is defined as 1 time unit for

RR. Also suppose that each process gets its first quantum as soon as it enters to the system.)
Answer: 4.5, 6

9. Three processes are running on a computer system, namely P1, P2 and P3. Due to the following table they run Up and Down operators on a semaphore S. If two processes are blocked and an Up operator is called, then the blocked process with the greater index would be run. What's the final state of these tree processes if they run the operators according to this table? (from left to right)

Process	P1	P2	P3	P2	P1	P3	P2	P2	P3	P1
Command	Down	Down	Up	Down	Up	Up	Down	Down	Up	Down