

Computer Science 3305b, Winter 2011-2012
Operating Systems

Assignment 2

Due: Thursday, February 9, 2012

1. (8%) What are three objectives of an operating system?
2. (8%) What is the kernel of an OS?
3. (8%) What is multiprogramming?
4. (8%) What is a process?
5. (8%) Explain the difference between a monolithic kernel and a microkernel?
6. (8%) What is multithreading?
7. (30%) Consider the Five-State Process Model. For each of the following transitions between process states, indicate whether the transition is possible. If it is possible, give an example of one thing that would cause it.
(a) *Ready* → *Blocked*; (b) *Running* → *Ready*; (c) *Running* → *Blocked*;
(d) *Blocked* → *Ready*; (e) *Blocked* → *Running*; (f) *Blocked* → *Exit*.
8. (22%) Suppose three processes A, B, C are running on a multi-processor system. Assume all processes are created at the time point 0 second (s). The table below shows which time intervals each process is running in. For all other intervals, the process is blocked.
 - Process A: 0s–5s, 40s–50s, 55s–60s
 - Process B: 5s–15s, 20s–30s, 45s–50s
 - Process C: 0s–5s, 15s–20s, 25s–40s, 45s–55s

Note that processes B and C terminate at 50s and 55s, respectively. Process A terminates at 60s.

- (a) What is the minimum number of processors that are required to satisfy precisely the above execution sequence?
- (b) What is the mean response time of the three processes?
- (c) Assume that processor utilization is 100% when one of the three processes is running on the processor. What is the average processor utilization of the whole system in the period from 0s to 60s? (Ignore the overhead of scheduling and other system services.)