

CS 4310 Operating Systems

Homework #1 (80 points) 8 questions

Due Date: 10/22

Question 1 (10 points):

Conduct a research and give the top five most popular operating systems of the world. Justify your answer and explain why they are the most popular.

Question 2 (10 points):

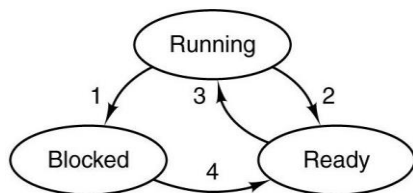
Which of the following instructions should be allowed only in kernel mode?

- (a) Disable all interrupts.
- (b) Change the time-of-day clock.
- (c) Read the time-of-day clock.
- (d) Clear the memory.

Question 3 (10 points):

Consider a computer system that has cache memory, main memory (RAM) and disk, and the operating system uses virtual memory. It takes 2 nsec to access a word from the cache, 10 nsec to access a word from the RAM, and 20 ms to access a word from the disk. If the cache hit rate is 90% and main memory hit rate (after a cache miss) is 98%, what is the average time to access a word?

Question 4 (10 points):



In the figure, three process states are shown. In theory, with three states, there could be six transitions, two out of each state. However, only four transitions are shown. Are there any circumstances in which either or both of the missing transitions might occur?

Question 5: (10 points):

What is the biggest advantage of implementing thread in kernel space? What is the biggest disadvantage?

Question 6 (10 points):

Five batch jobs A through E, arrive at a computer center at almost the same time. They have estimated running times of 7, 6, 3, 5, and 9 minutes. Their (externally determined) priorities are 3, 2, 1, 5, and 4, respectively, with 5 being the highest priority. For each of the following scheduling algorithms, determine the mean process turn-around time. Ignore process switching overhead.

- (a) Round robin (with time slice of 2 minute).**
- (b) Priority scheduling.**
- (c) First-come, first served (run in order A, B, C, D, E)**
- (d) Shortest job first.**

Question 7 (10 points):

(a) A RAID can fail if two or more of its drives crash within a short time interval. Suppose that the probability of one drive crashing in a given hour is C . What is the probability of a k -drive RAID failing in a given hour?

(b) A RAID can fail if three or more of its drives crash within a short time interval. Suppose that the probability of one drive crashing in a given hour is C . What is the probability of a k -drive RAID failing in a given hour?

Question 8 (10 points):

Disk requests come in to the disk driver for cylinders 25, 40, 7, 32, 22, 5 and 15, in that order.

A seek takes 20 msec per cylinder moved. How much seek time is needed for

- (a) First-come, first served.**
- (b) Shortest Seek First (SSF).**
- (c) Elevator algorithm (initially moving upward).**

In all cases, the arm is initially at cylinder 17.