



Tutorial Letter 102/0/2024 Assignment #3

**Operating Systems and Architecture
COS3721**

Year module

**Computer Science Department
School of Computing**

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Assignment 3 Questions

Important note:

Please note that the questions are based on the exercises in the prescribed textbook but, are not the necessary the same. So, if you do the exercises in the textbook, you will not have the same answers and your work will not be given any mark.

Question 1- (based on 11.12 and 11.16, p.527)**[20]**

(Ex0 11.12, p.526): Suppose that a disk drive has 4000 cylinders, numbered 0 to 3,999. The drive is currently serving a request at cylinder 1,150, and the previous request was at cylinder 1,805. The queue of pending requests, in FIFO order, is:

2,000; 1,212; 2,396; 2,800; 544; 1,618; 346; 1,523; 3,965; 3,681

Starting from the current head position, what is the total distance (in cylinders) that the disk arm moves to satisfy all the pending requests for each of the following disk-scheduling algorithms?

- a. FCFS (5)
- b. SCAN (5)
- c. C-SCAN (5)

(Ex0 11.16, p.527): Assume that you have a configuration comprising disks organized as RAID level 1 and RAID level 5 disks. Assume that the system has flexibility in deciding which disk organization to use for storing a particular file. Which files should be stored in the RAID level 1 disks and which in the RAID level 5 disks in order to optimize performance? (5)

Question 2- (based on: 12.8, 12.10 p. 567 and 14.12, 14.13, p. 640)**[20]**

(12.8, p.567):

- a) what is the advantage of supporting memory-mapped I/O to device-control registers? (5)
- b) what is the disadvantage of supporting memory-mapped I/O to device-control registers? (5)

(14.12, p.640): Consider a file system that uses inodes to represent files. Disk blocks are 8kB in size, and a pointer to a disk block requires 4bytes. This file system has 12 direct disk blocks, as well as single, double, and triple indirect disk blocks. What is the maximum size of a file that can be stored in this file system? (6)

(14.13, p.640): Explain why logging metadata updates ensures recovery of a file system after a file-system crash. (4)

Question 3- (based on: 15.7 p.664 and 16.7, p. 714)**[6]**

(15.7, p.664): Why do operating systems mount the root file system automatically at boot time? (2)

(16.3, p.713): An experimental addition to UNIX allows a user to connect a watchdog program to a file. The watchdog is invoked whenever a program requests access to the file. The watchdog then either grants or denies access to the file. Discuss two pros and two cons of using watchdogs for security. (4)

Question 4- (based on: 17.14 and 17.16, p.749)

[4]

(17.13, p.749): Discuss the strengths and weaknesses of implementing an access matrix using capabilities that are associated with domains (4)

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