CIS 350 – INFRASTRUCTURE TECHNOLOGIES
SMALL GROUP ACTIVITY #5

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Topic: Peripheral Devices

Logistics

1. Get in touch with your group of 4 or 5 students. (See Groups folder on Blackboard.)
2. Discuss and complete the assignment together via E-mail, Discussion Forum, Blackboard Collaborate Ultra, and/or MS Teams.
3. Choose a recorder to prepare the final copy (one per group) and submit it via the Blackboard Assignments/Small Group Activities folder to the instructor.
4. Be sure all group members' names are on final copy. Do not add names of your group classmates who did not participate in the assignment.

Work the following problems.

1. A hard disk contains 20 platters. The data is recorded on both surfaces of each platter. Each surface has 6,000 tracks. One track can hold 4,500,000 bytes of information.

What is the capacity (expressed in Megabytes) of one cylinder? Show your computations.
20 platters * 2 surfaces * 4,500,000 bytes = 180,000,000 bytes

To convert bytes to kilobytes, divide the number of bytes by 1024.
180,000,000 bytes/ 1024 = 175,781,25 kilobytes
To convert kilobytes to megabytes, divide the number of kilobytes by 1024.
175,781.25 / 1024 = 171.66 megabytes
To convert megabytes to gigabytes, divide the number of megabytes by 1024.
171.66 megabytes / 1024 = 0.17 gigabytes

What is the capacity (expressed in Gigabytes) of the entire hard disk? Show your computations.

171.661 MB * 6000 (tracks) = 1,029,968.262 MB
1,029,968.262 MB / 1024 = 1005.828 GB

2. Assume that the average seek time for the hard disk from problem 1 is 9 ms (milliseconds), there are 4,000 sectors on each track, and the disk rotates with 13,200 revolutions per minute.

A. Compute the average rotational delay (latency time). Compute the transfer time for 1 sector. Express both times in milliseconds. Then compute the total disk access time required to access 1 sector which is the sum of the three times: the average seek time, the average rotational delay (latency time), and the transfer time for 1 sector. Show your computations.

Seek time = 9 ms
RPM = 13200

(60/13200)*1000 = 4.5455 ms
Latency time = 4.5455/2 = 2.2727 ms
Transfer time = 4.5455/4000 = .00113636 ms
Total disk access time = (9 ms) + (2.2727 ms) + (.00113636 ms) = 11.2739 ms

B. Compute the transfer time for 3000 sectors. Express this time in milliseconds. Then compute the total hard disk access time required to read 3000 sectors which is the sum of the three times: the average seek time, the average rotational delay (which you have already computed in step 2A above), and the transfer time for 3000 sectors. Show your computations.

Transfer time = 3000*.00113636 = 3.4091 ms
Total disk access time = (9 ms) + (2.2727 ms) + (3.4091 ms) = 14.6818 ms

Notes:

- The average seek time is constant = 9 ms
- The average rotational delay is the same for 2A and 2B above
- The transfer time for problem 2B should be greater than for problem 2A because it takes more time to transfer 3000 sectors than 1 sector
- Distinguish between the time units: minutes, seconds, and milliseconds
    - 1 minute = 60 seconds
    - 1 second = 1,000 milliseconds