**COMP 3410 -**

**Operating Systems (3, 1, 0)**

**Winter, 2018**

**Lab/assignment 9: Mass Storage**

**JAGJIT SINGH BILKHU**

**Problem:**

1. Consider a disk queue holding requests to the following cylinders in the listed order: 116, 22, 3, 11, 75, 185, 100, and 87. Using the SCAN scheduling algorithm, what is the order that the requests are serviced, assuming the disk head is at cylinder 88 and moving upward through the cylinders?

A) 116 - 22 - 3 - 11 - 75 - 185 - 100 - 87

B) **100 - 116 - 185 - 87 - 75 - 22 - 11 – 3 starting from head at 88**

C) 87 - 75 - 100 - 116 - 185 - 22 - 11 - 3

D) 100 - 116 - 185 - 3 - 11 - 22 - 75 - 87

1. Consider a disk queue holding requests to the following cylinders in the listed order: 116, 22, 3, 11, 75, 185, 100, and 87. Using the FCFS scheduling algorithm, what is the order that the requests are serviced, assuming the disk head is at cylinder 88 and moving upward through the cylinders?

A) **116 - 22 - 3 - 11 - 75 - 185 - 100 – 87 starting from head at 88**

B) 100 - 116 - 185 - 3 - 11 - 22 - 75 – 87

C) 100 - 116 - 185 - 87 - 75 - 22 - 11 - 3

D) 87 - 75 - 100 - 116 - 185 - 22 - 11 – 3

1. What is rotational latency in the context of disk access time?

**This is the time taken for the desired sector to come under the read head**

* 1. Assume that the disk rotates at 6,000 rpm; each track of the disk has 16 sectors; data transfer rate of the disk is 64 MB/second; and average seek time of disk is 10 milliseconds. Calculate the average access time for the disk.

FOR AVERAGE TIME FOR THE DISK, INCLUDE DATA TRANSFER TIME FOR EACH BLOCK. ASSUME BLOCK SIZE IS 1KB

**Disk Rotation Speed = 6,000 rpm = 100rps**

**Sectors per Track = 16 sectors**

**Data transfer rate = 64 MB/second**

**Average seek time = 10 millisecond**

**Time to spin once = (1/100) seconds**

**Average rotation delay = time to spin half the disk = 1/200 seconds**

**Average data transfer time =**

**Amount of data/data rate = 1KB/64MBps = 0.015625 milliseconds**

**1 millisecond = 1000 micro seconds**

**1 second = 10,000,000**

**Average access time = Average Rotation delay + average transfer time + average seek time**

**= 5+** **0.015625 +** **10**

**= 15.015625milliseconds**

1. Consider a disk with a sector size of 512 bytes, 2000 tracks per surface, 50 sectors per track, five double-sided platters, and average seek time of 10 msec.
2. Calculate capacity of a track in bytes? What is the capacity of each surface? What is the capacity of the disk?

**Total memory per track = 50\*512 = 25600 bytes per track**

**Total memory per surface = 25600\*2000 = 51200000 bytes.**

**5 double sided platters = 10 surfaces,**

**Total disk capacity = 51200000\*10 = 512000000 bytes = 512 MB**

1. How many cylinders does the disk have?

**Number of cylinders on disk = number of tracks per surface = 2000**

1. Give examples of valid block sizes. Is 256 bytes a valid block size? 2048? 51,200?

**256 is not a valid block size**

**2048 is a valid block size since it is divisible by 512 and is smaller than the track size**

**51200 is not a valid block since it is larger than the total size of a track**

1. Suppose we have a 10000 RPM disk has 8 heads and 480 cylinders. It is divided into 120- cylinder zones with the cylinders in different zones containing 200, 240, 280, and 320 sectors. Assume each sector contains 4096 bytes and a seek time between adjacent cylinders of 2 msec. What is the total disk capacity?

**For 200 zone, each track: 200\*4096 = 819200**

**Total zone = 819200\*120 = 98304000**

**For 240 zone, each track: 240\*4096 = 983040**

**Total zone = 983040\*120 = 117964800**

**For 280 zone, each track: 280\*4096 = 1146880**

**Total zone = 1146880\*120 = 137625600**

**For 320 zone, each track: 320\*4096 = 1310720**

**Total zone = 1310720\*120 = 157286400**

**Total surface=sum of all zones 511180800 bytes**

**Total surfaces=8, total disk size = 511180800\*8 = 4,089,446,400 bytes = 4GB**