CS471: Operating System Concepts

Fall 2009

(Lecture: TR 9:30-10:45 AM)

Homework #4

Solutions

Points: 20

Due: October 29, 2009

Textbook (8th Edition; pages 548-552)

Question 1 [Points 5] Exercise 12.16

a. For FCFS sequence is 143, 86, 1470, 913, 1774, 948, 1509, 1022, 1750, 130. The total seek distance is 7081.

b. For SSTF sequence is 143, 130, 86, 913, 948, 1022, 1470, 1509, 1750, 1774. The total seek distance is 1745.

c. For SCAN sequence is 143, 913, 948, 1022, 1470, 1509, 1750, 1774, 4999, 130, 86. The total seek distance is 9769.

d. For LOOK sequence is 143, 913, 948, 1022, 1470, 1509, 1750, 1774, 130, 86. The total seek distance is 3319.

e. For C-SCAN sequence is 143, 913, 948, 1022, 1470, 1509, 1750, 1774, 4999, 86, 130. The total seek distance is 9813.

f. For C-LOOK sequence is 143, 913, 948, 1022, 1470, 1509, 1750, 1774, 86, 130. The total seek distance is 3363.

Question 2 [Points 10] Exercise 12.8

given, drive spin rate = 7200 RPM
sector size = 512 bytes.
sectors per track= 160.

a.

Number of spins per second = (7200/160) = 120
transfer size per spin= (512 * 160)= 8190/1024= 80.3Kbytes
thus, sustained transfer rate = (120 * 80.3/1024) = 0.94 megabytes per second

b.

given, huge transfer means a transfer of 500 cylinders of data.
total size = 500*20*160*512/1024=800,000 Kbytes.
total time = total rotation time + total track switch time + total cylinder switch time
= (20*500/120) + (20-1)*500*0.5/1000 + (500-1)*2/1000
= 83.33 + 4.75 + 0.998 = 89.1 seconds

c.

time transfer one sector = average seek time + average rotational latency + time to rotate one sector
= 8 ms + 0.5/120 s + (1/120)*(1/160)
= 8 ms + 4.167 ms + 0.416 ms
= 12.22 ms
effective transfer rate = 1000*512/12.58 = KBps.

d.

for 4KB transfer size
Number of sectors = 4KB/secor size=4/0.5=8 secors.

time transfer one sector = average seek time + average rotational latency + time to rotate 8 sectors
= 8 ms + 0.5/120 s + (1/120)*(1/160)*8
= 8 ms + 4.167 ms + 0.052*8 ms
= 12.58 ms
effective transfer rate = 1000*4KB/12.58 = 317.96 KBps.

for 8KB transfer size
Number of sectors = 4KB/secor size=8/0.5=16 secors.

time transfer one sector = average seek time + average rotational latency + time to rotate 8 sectors
= 8 ms + 0.5/120 s + (1/120)*(1/160)*16
= 8 ms + 4.167 ms + 0.052*16 ms
= 12.99 ms
effective transfer rate = 1000*8KB/12.99 = 615.86 KBps.

for 64KB transfer size
Number of sectors = 4KB/secor size=64/0.5=128 secors.

time transfer one sector = average seek time + average rotational latency + time to rotate 8 sectors
= 8 ms + 0.5/120 s + (1/120)*(1/160)*128
= 8 ms + 4.167 ms + 0.052*128 ms
= 18.82 ms
effective transfer rate = 1000*64KB/18.82 = 3400.64 KBps.

e.

given seek time= 3ms

Number of sectors = 4KB/secor size=8/0.5=16 secors.

time transfer one sector = average seek time + average rotational latency + time to rotate 8 sectors
= 3 ms + 0.5/120 s + (1/120)*(1/160)*16
= 3 ms + 4.167 ms + 0.052*16 ms
= 7.99 ms
effective transfer rate = 1000*8KB/7.99 = 1000 KBps.

Question 3 [Points 5] Exercise 12.24

a.

As it given parity of four blocks on four disks stored on fifth disk.

if we need to write of one block of data, it is needed to access both

1. we need to access the block that has this one block data.
2. after writing parity of will changed and one more disk is accessed to update new parity.

total of two disks are accessed.

b.

As we know four continuous blocks have one parity.

for writing data= 7 disks are accessed

for updating parity = 2 disks are accessed.

total number of disks accessed = 7+2 = 9 disks.

(Hint: For 12.8b, assume the huge transfer means a transfer of 500 cylinders of data. This will be 500*20*160*512 bytes.)