Name: Feb 28, 2002

CSci 124 Midterm 1
Maximum possible 20 points
There are 7 pages
Show your work

1 point 1.

A certain disk drive have 25649 tracks per surface and 5 surfaces. Each track has forty 512-byte sectors. The disk rotates at 36,000 revolutions per minute. What is the average latency time in milliseconds?

2.5 pts 2. Consider a 1,000,000 eighty-byte record mailing-list file. The file is to be backed up on 2400-foot reels of 6250-bpi tape with 0.5-inch interblock gaps. Tape speed is 200 inches per second. The blocking factor is 40. (Each part is worth 0.5 point.)

(a) What is the physical length of the **data** block in inches?

(b) What is the physical block length including the gap?

(c) How long would it take to read one block, including the gap?

(d) What would the effective transmission rate be?

(e) How long would it take to read the entire file?

4 points 3. Suppose we have a 'typical' 300-megabyte fixed disk with the following specifications: ms - millisecond

Minimum (track-to-track) seek time	1 ms
Average seek time	3.9 ms
Rotational delay	3 ms
Maximum transfer rate	16.7ms/track or 1229 bytes/ms
Bytes per sector	512
Sectors per track	40
Tracks per cylinder	11
Tracks per surface	1331
Interleave factor	1
Cluster size	8 sectors
Smallest extent size	5 clusters

We have a 4096 K-byte file that is divided into 16,000 256-byte records.

(a) **How many records can one cluster hold? (1/2 point)**

(b-i) The file will be stored as a sequence of how many clusters? (1/2 point)

(b-ii) How many extents will we need? (1/4 point)

(b-iii) How many tracks will we need? (1/4 point)

We shall assume that the number of tracks calculated in (b-iii) are randomly dispersed.

(c) **Estimate the time it takes to read a 4096 K-byte file** from the disk sector by sector **in sequence**. (1 1/4 pt)

(d) Estimate the time it takes to read the same 16,000 records using **random access**. (1 1/4 points)

3 points 4. Given a magnetic tape drive with the manufacturer specifications

density = 6250 bytes/inch
IRG =0.3 inch
speed = 300 inches/second

Given a file with 50,000 records, each is 100 bytes and with a blocking factor of 25, please answer the following questions.

(a) How many blocks are in the file? (1/2 point)

(b) What is the block size in bytes? (1/2 point)

(c) What is the physical block length in inches? (1 point)

(d) How many inches of tape are required to store this file? (1 point)

4 points 5. The FAT 3350 disk drive uses block-addressing. It has 19,069 usable bytes available per track, 30 tracks per cylinder, and 555 cylinders per drive. The disk rotates at 10,000 rpm. Suppose we have a file with 250,000 100-byte records that we wish to store on a 3350 drive. Suppose the blocking factor is 10, and that we use the count-data subblock organization. Recall in that case the extra space used by count subblock and interblock gaps is equivalent to 185 bytes.

(a) How many blocks can be stored on one track?(1/2 point)
How many records? (1/2 point)

(b) How many cylinders are required to hold the file? (1/2 point)

(c) What is the rotational delay? (1/2 point)

(d) If the file were stored on contiguous cylinders and if there were no interference from other processes using the disk drive, the average seek time for a random access of the file would be about 8 ms. Compute the average time needed to access one record randomly. (2 points)

2 points 6.
Consider a 1,000,000 one hundred-byte record mailing-list file. The file is to be backed up on 2400-foot reels of 6250-bpi tape with 0.5-inch interblock gaps. What would be the minimum blocking factor required to fit the file onto the tape?

2 points 7. Given the following configuration:

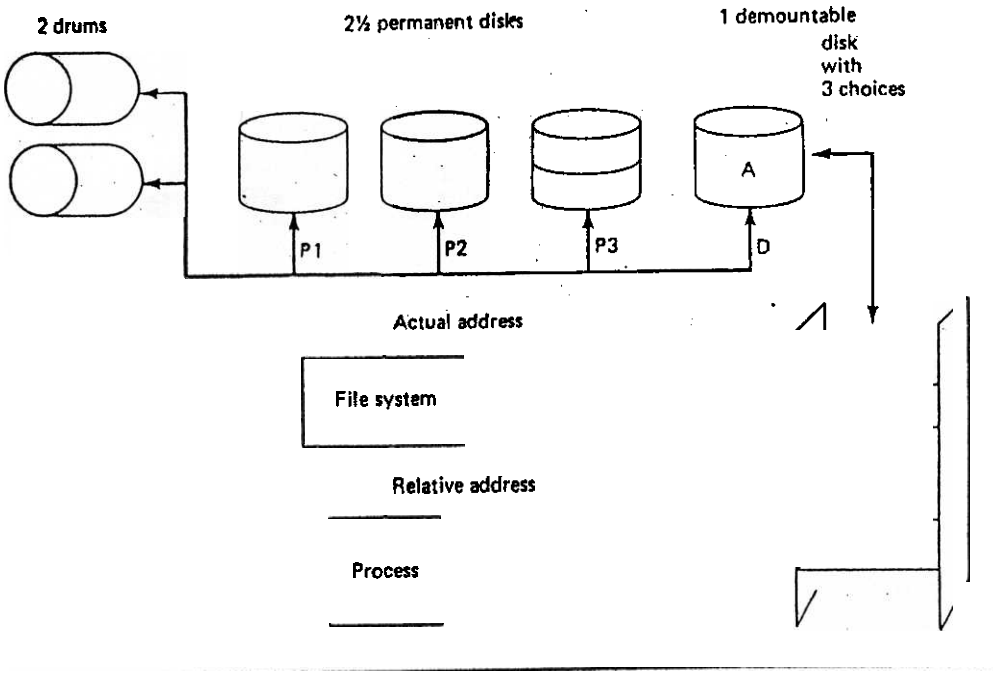

Figure 3-13 Relative block addressing.

Table 3-4 Relative block addressing.

Equipment in the domain of the file system				
Number	Type	Cylinders per unit	Tracks per cylinder	Blocks per track
2	Head per track disks	1	128	16
2.5	Permanent disks	400	20	8
1	Disk drive with choice of 3 packs	200	20	4

Given the RBA = 135324,

Which device does the data reside on?

Which cylinder does the data reside on?

Which track does the data reside on?

Which block does the data reside on?

1.5 points 8 Given a file of 100,000 records, each of length 256 bytes.

(a) What is the maximum blocking factor if 10,000 bytes of main storage are available, assuming single buffering? (0.5 point)

(b) If it takes input time of 51.05 ms per block, and 25 ms to process a block, compute the total time to input and process the above file using single buffering. (1 point)