

CS 351 DATA ORGANIZATION AND MANAGEMENT

Homework No. 1

Date Given : September 28, 2009

Date Due : October 6, 2009

Important Notes: 1. Please submit the Homework to Room EA 231 on the due date by 5:00 pm (no late submission will be accepted). 2. Answer the question in the order they are given using a standard size paper. 3. Handwritten submissions are accepted a word document is preferred. 4. Staple all papers and write your name on them. 5. To answer questions related to tape drives etc. visit the course web page: <http://www.cs.bilkent.edu.tr/~canf/CS351Fall2009/> (see old lecture notes).

Q1. Prepare a table giving comparative information as to Capacities, Speeds of Access and Costs (\$/Mbyte) for the storage devices in the hierarchy. Include Semiconductor RAMS, Hard Discs, Floppy or Flexible Disks, CD-ROMs, DVDs, BluRay Optical Media and Magnetic Tapes/Cassettes. Indicate the unit of measurement information for the characteristics under consideration.

Q2. a) Compute the time it takes for one full revolution of a disk (Winchester Disk) for angular speeds in revolutions per minute of a) 5400 rpm and b) 7200 rpm
b) Compute the average rotational delay for the above disks.

Q3. Consider two tracks T1 and T2 on a disk platter surface with radius $R_1 < R_2$, respectively.
a) Which track has a greater recording capacity than the other? Why?
b) Which track's recording density (bits/inch) is higher?
c) Are the recording capacities or the recording densities of the two tracks equal? Explain.

Q4. Consider sequential processing of physically adjacent n blocks on successive tracks of the same cylinder vs. random processing of the same number of blocks. Assume the disk parameters are: $s = 15$ msec, $r = 5$ msec, $b_{tt} = 0.8$ msec and $e_{bt} = 0.84$ msec. Compute the times T_s (=total time for sequential processing) and T_r (=total time for random processing) for $b = 100$ and for $b = 1,000,000$ blocks. Compute the T_r/T_s for very large b .

Q5. Consider a sequential magnetic medium with the following parameters:

Recording density	= 1600 bytes/inch
Inter Block Gap	= 0.5 inches
Length of a tape reel	= 2400 feet (1 foot=12 inches)
Start/stop time	= 10 mseconds
Read/write speed	= 200 inches/sec

- Does a file with 36 000 records of 800 bytes each fit on a single tape reel if no blocking is used?
- What is the minimum Blocking Factor for which this file fits on a single reel of tape?
- For $B_{kf} = 10$, compute the length of tape required to store this file.
- Compute the time required to process this file for $B_{kf} = 1$ and $B_{kf} = 12$.

Q6. A sequential file on a sequential magnetic medium is exhaustively read in 100 seconds when the Blocking Factor is 2. Doubling the blocking factor reduced the exhaustive total read time for the same file to 70 seconds.

Assume that a single gap is passed in 0.01 msec.

What is the time for data transfer only (not including the time to pass over the gaps)?