Tutorial #4

6 .5 A distinction is made between physical records and logical records. A logical record is a collection of related data elements treated as a conceptual unit, independent of how or where the information is stored. A physical record is a contiguous area of storage space that is defined by the characteristics of the storage device and operating system. Assume a disk system in which each physical record contains thirty 120-byte logical records. Calculate how much disk space (in sectors, tracks, and surfaces) will be required to store 300,000 logical records if the disk is fixed-sector with 512 bytes/sector, with 96 sectors/track, 110 tracks per surface, and 8 usable surfaces. Ignore any file header record(s) and track indexes, and assume that records cannot span two sectors.

# of Logical records per sector = 512 /int 120 = 4 records

# of Logical records per track = 96 * 4 = 384 records

# of Logical records per surface = 384 * 110 = 42240 records

# of completed surfaces = 300000 /int 42240 = 7 with another uncompleted surface

# of completed track in the last uncompleted surface = (300000 mod 42240) /int 384 = 11 with another uncompleted track

# of completed sector in the last uncompleted track = ((300000 mod 42240) mod 384) / 4 = 24

Where; 300,000 = (7*42240) + (11*384) + (24*4)

6.6 Consider a disk that rotates at 3600 rpm. The seek time to move the head between adjacent tracks is 2 ms. There are 32 sectors per track, which are stored in linear order from sector 0 through sector 31.The head sees the sectors in ascending order. Assume the read/write head is positioned at the start of sector 1 on track 8. There is a main memory buffer large enough to hold an entire track. Data is transferred between disk locations by reading from the source track into the main memory buffer and then writing the date from the buffer to the target track.

a. How long will it take to transfer sector 1 on track 8 to sector 1 on track 9?

b. How long will it take to transfer all the sectors of track 8 to the corresponding sectors of track 9?

a) Time to transfer sector 1 on track 8 to sector 1 in track 9= 1/r + 1/(spt*r) = (60*103 /3600) + (60*103 /3600*32) = 17.1875 ms

b) Time to transfer track 8 to track 9 = 2/r + tseek = (2*60*103 /3600) + 2ms = 35.334 ms

6.10 Design a backup strategy for a computer system. One option is to use plug-in external disks, which cost \$150 for each 500 GB drive. Another option is to buy a tape drive for \$2500, and 400 GB tapes for \$50 apiece. (These were realistic prices in 2008.) A typical backup strategy is to have two sets of backup media onsite, with backups alternately written on them so in case the system fails while making a backup, the previous version is still intact. There's also a third set kept offsite, with the offsite set periodically swapped with an on-site set.

a. Assume you have 1 TB (1000 GB) of data to back up. How much would a disk backup system cost?
b. How much would a tape backup system cost for 1 TB?
c. How large would each backup have to be in order for a tape strategy to be less expensive?

Given: Cost of 500 GB disk drive = 150\$
Cost of Tape drive = 2500\$ with 50 \$ for each piece of 400 GB
# of back-up = 3

a) For 1 TB = 1000 GB, Cost using disk = (1000 GB/500 GB) * 150\$ *3 = 900\$
b) Cost using Tape = 2500\$ + 3*(3*50\$) = 2950\$
c) Disk > tape → required capacity
   3*(x/500GB)*150\$ > 2500\$+3*50\$*(x/400GB)
   x>4762 GB