**CS 420**

**HOMEWORK ASSIGNMENT H6**

1. Assume that a file system uses i-nodes to represent files. Disk blocks are 8-KB in size and a pointer to a disk block requires 4 bytes. This file system has 12 direct disk blocks, plus single, double, and triple indirect disk blocks. What is the maximum size of a file that can be stored in this file system?

**64 Terabytes**

1. A file system on an external hard disk has both logical and physical block sizes of 512 bytes. The directory information about each file is already in memory. Answer the following questions for each of three allocation strategies - contiguous, linked, and indexed:
   1. How is the logical-to-physical address mapping accomplished in this system? (For the indexed allocation, assume that a file is always less than 512 blocks long.)
   2. If the user is currently at logical block 10 (the last block accessed was block 10) and wants to access logical block 4, how many physical blocks must be read from the disk?
2. **Contiguous**
   1. **Divide the logical address by 512, this results in the Q and R which are used to find the data**
   2. **1, Random access is possible in contiguous**
3. **Linked**
   1. **Divide the logical address by 511, this give the Q and R**
   2. **4**
4. **Indexed**
   1. **Divide the logical address by 512. The found Q and R are used in the index block. The desired physical block is found at Q in the index, and R is the displacement within the physical block**
   2. **2**
5. Assume that a disk drive has 5000 cylinders, numbered 0 to 4999. The drive is currently serving a request at cylinder 143, and the previous request was at cylinder 125. The queue of pending requests, in FIFO order, is 86, 1470, 913, 1774, 948, 1509, 1022, 1750, 130. Starting from the current head position, what is the total distance (in cylinders) that the disk arm moves to satisfy all the pending requests, for each of the following disk-scheduling algorithms?
   1. FCFS
      1. **7081**
   2. SSTF
      1. **1745**
   3. SCAN
      1. **9769**
   4. LOOK
      1. **3319**
   5. C-SCAN
      1. **9985**
   6. C-LOOK
      1. **3493**
6. How much time would it take to read a sector on a hard disk drive if it rotates at 7200 rpm, has 500 sectors per track and sectors contain 512 bytes?
   1. **8.3166ms**
7. What is the minimum data transfer rate of the disk in the previous question? The answer should be stated in bytes/sec.
   1. **3.084x10­7 bytes/sec**
8. A vendor of hard disk drives has two models using the same size disks and also each drive has 10,000 cylinders. The only difference is that the more recent model has a higher linear data density than the older model. What performance parameters are different between the two models and which parameters are the same?

**It affects the number of bits that fit in the sectors of the disk. A higher linear data density allows more bits to be stored in that sector. This affects the data transfer rate. The other properties of the disk remain unchanged.**

Either type your solutions or print legibly. Solutions that cannot be easily deciphered are incorrect!

General Instructions:

* Homework submissions should be prepared using computer document preparation applications such a word processor or similar editor. Handwritten solutions are only acceptable if they are neat and can be easily read by the grader – neatness, readability and grammar count!
* Homework submissions will be clearly marked with the student’s name, date and assignment identification at the top of the first page.
* All homework is to be completed by each student individually and represent that student’s original, unassisted work. Any material copied in any way from other sources must be clearly identified and attributed.
* The problem solutions printed on paper are submitted at the start of class on the due date.