7. [10 pt] A floppy disk has 40 cylinders. A seek takes 6 msec per cylinder moved. If no attempt is made to put the blocks of a file close to each other, two blocks that are logically consecutive (*i.e.* follow one another in the file) will be about 13 cylinders apart, on the average. If, however, the OS makes an attempt to cluster related blocks, the mean interblock distance can be reduced to 2 cylinders (for example). How long does it take to read a 100 block file in both cases, if rotational latency is 100 msec and the transfer time is 25 msec per block?

8. [10pt] Consider a disk with c cylinders, t tracks per cylinder, s sectors per track, and a sector length sl. A logical file L with fixed record length rl is stored contiguously on this disk starting at location (c_L, t_L, s_L), where c_L, t_L, and s_L are the cylinder, track, and sector numbers, respectively.

   (a) Derive a formula to calculate the disk address (*i.e.*, cylinder, track, sector) of a given logical record n, assuming that

      i. $rl \leq sl$

      ii. $rl > sl$

   (b) How many seek operations are necessary to read an entire file of m logical records?

CS 376 **Operating Systems** Test 3

Name: Maximum Points: 64

Important: This is an open book test. *Do not log into the computer during the test.* You may use any paper or books.

1. [10 pt] A minicomputer uses the First-Fit system for memory management. Initially, it has one block of 256K at address 0. After successive requests for 5K, 25K, 35K, and 20K come in, how many blocks are left and what are their sizes and addresses? Repeat the problem for best fit algorithm.

2. [5 pt] If an instruction takes 10 nsec and a page fault takes an additional n μsec, give a formula for the effective instruction time if page faults occur every k instructions.

3. [9 pt] A computer has four page frames. The time of loading, time of last access, and the reference (R) and dirty (M) bits for each page are as shown below (the times are in clock ticks):

Page	Loaded	Last ref.	R	M
0	126	279	0	0
1	230	260	1	0
2	120	272	1	1
3	160	280	1	1

   (a) Which page will FIFO replace?

   (b) Which page will LRU replace?

   (c) Which page will second chance replace?

4. [10 pt] How long does it take to load a 64K program from a disk whose average seek time is 30 msec, whose rotation time is 20 msec, and whose tracks hold 32K

   (a) for a 2K page size?

   (b) for a 4K page size?

5. [5 pt] Systems that support sequential files always have an operation to rewind files. Do systems that support random access files need that too?

6. [5 pt] Some operating systems provide a system call `rename` to give a file a new name. Is there any difference at all between using this call to rename a file, and just copying the file to a new file with the new name, followed by deleting the old one?