CSI 2131 A/B
Winter 2000 Midterm

Professor: Ken Barker
Saturday, February 12, 10:00

Family Name	
Given Name	
Student Number	
Section (circle one)	A B

Notes:

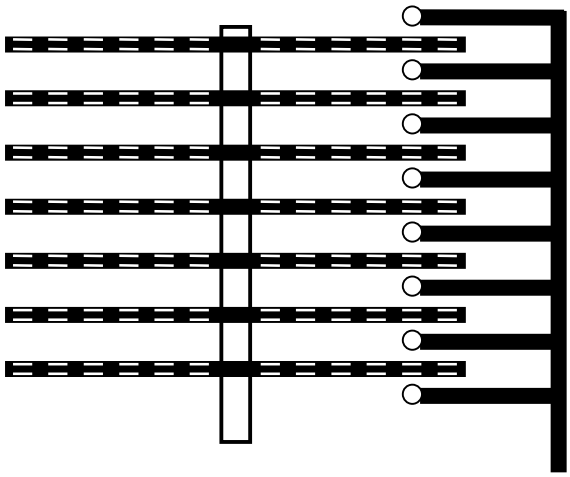
1. This is a closed book exam. Textbooks, notes, cheat sheets and LCD goggles are **not** allowed.
2. Calculators, computers, mobile agents and all other computing devices are **not** allowed (use of fingers and toes suggested).
3. There are 8 pages. Write your name and student number on **every** page.
4. There are 5 questions. Answer **all** 5 of them.
5. Write **all** answers and work in the space provided. Use **no** other paper.
6. You have 80 minutes to complete the exam.

Marks:

Question					
1 (3.5 marks)	2 (4.0 marks)	3 (4.5 marks)	4 (6.0 marks)	5 (2.0 marks)	*Total (20.0 marks)*

Question 1: Secondary Storage Devices

Here is a cross-sectional "picture" of a hard disk with several platters. Each white spot represents a track.



a) How many *cylinders* are there on this disk? 6

b) If the disk is spinning at 3000 revolutions per minute, what is the *average latency* for the disk (in milliseconds)?

3000rev/min = 50rev/sec
therefore 1 rev takes 20ms
therefore 1/2 rev takes 10ms

c) If there are 100 sectors on each track and each sector has 512 bytes, How long does it take to transfer 2560 bytes (in milliseconds)?

2560 bytes = 5 sectors
100 sectors take 20ms
therefore 5 sectors take 1ms

d) This "picture" represents a CD-ROM. How many tracks are there? 1 spiral track

Question 2: File Allocation Tables

Here is a picture of the File Allocation Table (FAT) on some disk.

0x0001	0x0002	0x0006	0x0000	0x0005	0x0007	0x000E	0x0008
0xFFFF	0xFFFF	0x0000	0x0000	0x000F	0x0020	0xFFFF	0x000D
0x0000	0xFFFF	0x0000	0x0000	0x0000	0x0011	0x0015	0x0016
0x0019	0x001A	0x001B	0x001C	0x001D	0x001E	0x001F	0x0021
0xFFFF	0x0022	0xFFFF	0x0000	0x0000	0x0017	0x0018	0x0000

Assume that each entry in the FAT corresponds to one cluster on disk and assume that clusters contain 2000 bytes.

For each file on this disk, list the clusters occupied by the file and give an estimate of the file's length. You can use the table below to write your answers (there is enough space for 10 files, but there are fewer than 10 files in the FAT).

	Clusters	***Approximate Size***
File 1	0x00 0x01 0x02 0x06 0x0E	8000-10000 bytes
File 2	0x04 0x05 0x07 0x08	6000-8000 bytes
File 3	0x09	< 2000 bytes
File 4	0x0C 0x0F 0x0D 0x20	6000-8000 bytes
File 5	0x25 0x17 0x16 0x15 0x11	8000-10000 bytes
File 6	0x26 0x18 0x19 0x1A 0x1B 0x1C 0x1D 0x1E 0x1F 0x21 0x22	20000-22000 bytes
File 7		
File 8		
File 9		
File 10		

Question 3: Buffer Replacement Policies

You have four system I/O buffers. A program requests five different clusters (5, 11, 13, 14, 33) in the following order:

```
5  11  13  14  33  13  14  13  33  5  11  33  14  13  14  5
```

State the number of buffer replacements for each of the following buffer replacement policies. You may use the tables on the next page for rough work if you like.

BRP	***# of replacements***
First-In-First-Out (FIFO)	5
Least Recently Used (LRU)	6
Least Frequently Used (LFU)	4

<tables for optional rough work on next page>

<tables for optional rough work>

requests:	5	11	13	14	33	13	14	13	33	5	11	33	14	13	14	5
replace:					5					11	13			14	33	
buffer 1	5	5	5	5	33	33	33	33	33	33	33	33	33	33	14	14
buffer 2		11	11	11	11	11	11	11	11	5	5	5	5	5	5	5
buffer 3			13	13	13	13	13	13	13	13	11	11	11	11	11	11
buffer 4				14	14	14	14	14	14	14	14	14	14	13	13	13

requests:	5	11	13	14	33	13	14	13	33	5	11	33	14	13	14	5
replace:					5					11	14		13	5		11
buffer 1	5	5	5	5	33	33	33	33	33	33	33	33	33	33	33	33
buffer 2		11	11	11	11	11	11	11	11	5	5	5	5	13	13	13
buffer 3			13	13	13	13	13	13	13	13	13	13	14	14	14	14
buffer 4				14	14	14	14	14	14	14	11	11	11	11	11	5

requests:	5	11	13	14	33	13	14	13	33	5	11	33	14	13	14	5
replace:					5					11	5					11
buffer 1	5/1	5/1	5/1	5/1	33/1	33/1	33/1	33/1	33/2	33/2	33/2	33/3	33/3	33/3	33/3	33/3
buffer 2		11/1	11/1	11/1	11/1	11/1	11/1	11/1	11/1	5/1	11/1	11/1	11/1	11/1	11/1	5/1
buffer 3			13/1	13/1	13/1	13/2	13/2	13/3	13/3	13/3	13/3	13/3	13/3	13/4	13/4	13/4
buffer 4				14/1	14/1	14/1	14/2	14/2	14/2	14/2	14/2	14/2	14/2	14/2	14/3	14/3

Question 4: Programming for File Management

Write a program (preferably in high-level pseudocode, but C or Pascal if you insist) that reads data from two files and writes some of the information to a third file. Here are the details:

- Open the three ASCII files specified on the command line.
- The first file contains records with fixed length fields: student number (7 characters) and student name (20 characters).
- The second file contains records with variable length fields: student number, age, shoe size and most embarrassing body mark. The fields are all sequences of ASCII characters separated by commas (‘,’). Records end with a semi-colon (‘;’).
- Read through the two input files comparing the student number in the first file to the student number in the second file:
  - if the student numbers are the same, write out the student’s name and shoe size to the third file as variable length fields separated by a comma (‘,’); write a semi-colon (‘;’) after the shoe size
  - if the student numbers are different, read through to the next record in both input files writing no output to the third file.
- Your program should read through all the records, stopping when either one of the input files is finished.

<there is extra space for your program on the next page>

Question 5: File Management *(circle one letter for each of the 8 questions)*

i) Fixed length records
   a) require fixed length fields
   b) allow a more compact representation of data than variable length records
   c) are easier for humans to read than variable length records
   d) are more appropriate for hard disks than CD-ROMs

ii) Stream input/output
   a) provides a consistent byte-by-byte view of all input and output (files, keyboard, display, etc.)
   b) is available only in C++
   c) is inefficient
   d) cannot be used for binary files

iii) Normally, the slowest part of getting at the data on a disk is
   a) transfer time per byte
   b) latency
   c) seek time
   d) waiting for the Novell server to reboot

iv) Constant Linear Velocity (CLV)
   a) is used on hard disks only
   b) is used on newer CD-ROM drives only
   c) places more stress on the spindle motor than CAV
   d) does not appear in the course notes

v) A cluster
   a) contains 16 sectors
   b) contains 8192 bytes
   c) is the smallest chunk of disk accessed by the operating system
   d) all of the above

vi) The File Allocation Table
   a) contains all of the clusters on disk
   b) contains chains
   c) has an entry for each open file
   d) allocates system resources for files

vii) System input/output buffers
   a) are necessary for stream input/output to work efficiently
   b) may be managed directly by application programs
   c) may contain data from more than one file at a time
   d) are manipulated by the I/O processor and the disk controller

viii) "Second chance" refers to
   a) a BRP
   b) a FAT
   c) a BLCH
   d) a FRT