MCS243 Midterm Exam

Serial #:

This exam is closed-book and mostly closed-notes. You may, however, use a single 8 1/2 by 11 sheet of paper with hand-written notes for reference. (Both sides of the sheet are OK.)

Please write your name only on this page. Do not turn the page until instructed, in order that everyone may have the same time. Then, be sure to look at all problems before deciding which one to do first. Some problems are easier than others, so plan your time accordingly. You have 90 minutes to work.

Write the answer to each problem on the page on which that problem appears. You may use the back of that same sheet if you need additional space. You may also request additional paper, which should be labeled with your test number and the problem number.

To get partial credit for a problem that you answer wrong, you will need to explain your reasoning.

If you are stuck, I am willing to sell you a hint for some points.

Name: ____

Problem	Page	Possible	Score
1	2	12	
2	3	12	
3	4	12	
4	5	12	
5	6	12	
6	7	12	
Total		72	

1. [**12 Points**] Consider the following relational algebra query:

$$(\text{Orders}[\text{CID}] \bowtie \text{Customers})[\text{city}]$$

(a) What does this query find? (I.e., translate it into English.) Be sure your answer would be correct even if the tables had different specific rows of data than we have been using, so long as the general structure (columns) stayed the same.

(b) Write a slightly simpler relational algebra query that is equivalent.

(c) Translate the query into SQL. Ensure there are no duplicate rows in the result.

2. [**12 Points**] A table, Payments, contains three columns: person, dollars, and date. Each row contains the name of a person, how many dollars they paid, and the date when they paid it. The same person can make several payments, on different dates. Show the SQL query to output a summary table showing for each person the total amount of their payments. Any payment that isn't positive should be excluded from the total, and if a person's positive payments didn't total at least $10, then that person should be excluded from the summary table.

3. [**12 Points**] Suppose R and S are as shown:

R =

A	B	C
a1	b1	c1
a2	b2	c1
a1	b1	c2

S =

C	D	E
c1	d1	e1
c2	d2	e2
c2	d3	e1
c3	d3	e3

(a) What is $R \bowtie S$?

(b) What SQL query could you do to find this?

4. [**12 Points**]

(a) Draw a table, S, so that R $\bowtie$ S is the same as the selection "R where id = 3". All you know about the table R is that it has a column, id, containing integers. (It may have other columns too.)

(b) Draw a table, T, so that R $\bowtie$ T is the same as the selection "R where id = 3 or id = 5". R is as above.

(c) Draw a table, U, so that R $\bowtie$ U is the same as the selection "R where id = 3 and id2 = 5". Now you should assume R has integer-valued columns called both id and id2. (It may have other columns too.)

5. [**12 Points**] Translate the following SQL query into English. Give two different translations: one that uses some negative word (like "no", "not", or "none"), and one which uses no such word.

```
select distinct a.actor from movie_actors a
  where not exists (select * from movie_info m, movie_actors a2
                    where m.id = a2.id
                    and a2.actor = a.actor
                    and m.year_made >= 1980);
```

6. [**12 Points**] For each set of columns, tell whether it would constitute a key for the corresponding table, a superkey but not a key, or neither. Assume that the designer's intent can be inferred from the specific values shown in the tables. You can write your answers as K, S, or N, for key, superkey (but not key), or neither.

R =

A	B	C
a1	b1	c1
a1	b2	c1
a2	b1	c2

S =

D	E	F
d1	e1	f1
d1	e2	f1
d2	e1	f1

(a) $\{A\}$ in table R

(b) $\{B\}$ in table R

(c) $\{C\}$ in table R

(d) $\{A, B\}$ in table R

(e) $\{A, C\}$ in table R

(f) $\{B, C\}$ in table R

(g) $\{A, B, C\}$ in table R

(h) $\{D\}$ in table S

(i) $\{E\}$ in table S

(j) $\{F\}$ in table S

(k) $\{D, E\}$ in table S

(l) $\{D, F\}$ in table S

(m) $\{E, F\}$ in table S

(n) $\{D, E, F\}$ in table S