CS3550 (DBMS-I)
Segment 3-4
Final Exam
Sunday, Nov 15, 2020
Time Limit: -

Name (	(Print):	
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This exam contains 8 pages (including this cover page) and 10 problems. Check to see if any pages are missing. Enter all requested information on the top of this page, and put your initials on the top of every page, in case the pages become separated.

You may *not* use your books, notes, or any calculator on this exam.

You are required to show your work on each problem on this exam. The following rules apply:

- You have to return the question paper along with the answers written in the empty spaces provided. Please use the extra sheets provided to do the rough work and not on the question paper.
- Make sure that the answers for the subjective type and the reasons for the objective type are clearly written. Note that we value precision and conciseness in the answers. If you need to make any additional assumptions, write them clearly.
- The marks for each question and each subquestion are given.

Do not write in the table to the right.

Problem	Points	Score
1	10	
2	10	
3	10	
4	10	
5	10	
6	10	
7	10	
8	10	
9	10	
10	10	
Total:	100	

1. (10 points) Consider the two relation schemas for **EMPLOYEE** and **DEPARTMENT** as follows:

## Relation E (for EMPLOYEE)

enr	ename	dept
1	Bill	Α
2	Sarah	C
3	John	Α

## Relation D (for DEPARTMENT)

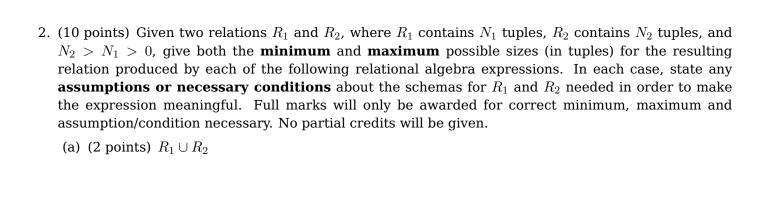
dnr	dname
Α	Marketing
В	Sales
C	Legal

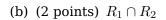
Given a SQL statement as follows:

select \* from E, D where dept = dnr

(a) (6 points) Write the *Relational algebra expression* for the given SQL (without using a natural or inner join) and

(b) (4 points) the resulting tuples.





(c) (2 points) 
$$R_1 - R_2$$

(d) (2 points) 
$$R_1 \times R_2$$

(e) (2 points) 
$$\sigma_{a=5}(R_1)$$

3.	(10 points) Given a keyword like $TOP(k)$ that returns the top-k tuples (e.g.: SELECT TOP(K) $\langle A_1, A_2,, A_n \rangle$ ), write a SQL query to find the 10-th highest employee salary from an <b>EMPLOYEE</b> table. Explain your answer.
	Note: You may assume that there are at least $10$ records in the <b>EMPLOYEE</b> table.
1	(10 points) Given a table <b>TBL</b> with a field <b>Nmbr</b> that has rows with the following values:
т.	1,0,0,1,1,1,0,0,1,0,1,0,1
	Write a query to add 2 where Nmbr is 0 and add 3 where Nmbr is 1.

5. (10 points) Consider the following schema and provide the relational algebra expression:

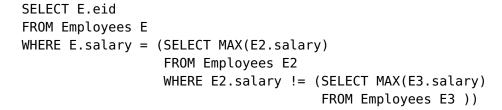
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Suppliers(sid: integer, sname: string, address: string)
Parts(pid: integer, pname: string, color: string)
Catalog(sid: integer, pid: integer, cost: real)
```

The primary keys of the table are outlined in bold font.

Find the Supplier ids of the suppliers who supply both a red part and a green part where each costs less than 100 dollars.

6. (10 points) For the following SQL query provide the equivalent relational algebra expression. Note that relational algebra has no MAX operator!

7. (10 points) As a continuation to problem 6, for the following SQL query provide the equivalent relational algebra expression. Note that relational algebra has no *MAX* operator!



8. (10 points) Consider the schema from problem 5 and provide the SQL for:

For every supplier that supplies both a green part and a red part, print the name and price of the most expensive part that he/she supplies.

## 9. (10 points) Given the following tables:

SELECT \* FROM users;

${\sf user\_id}$	username
1	John Doe
2	Jane Don
3	Alice Jones
4	Lisa Romero

SELECT \* FROM training\_details;

user_training_id	${\sf user\_id}$	$training_{-}id$	$training\_date$
1	1	1	"2015-08-02"
2	2	1	"2015-08-03"
3	3	2	"2015-08-02"
4	4	2	"2015-08-04"
5	2	2	"2015-08-03"
6	1	1	"2015-08-02"
7	3	2	"2015-08-04"
8	4	3	"2015-08-03"
9	1	4	"2015-08-03"
10	3	1	"2015-08-02"
11	4	2	"2015-08-04"
12	3	2	"2015-08-02"
13	1	1	"2015-08-02"
14	4	3	"2015-08-03"

Write a query to to get the list of users who took a training lesson (identified by training\_id) more than once in the same day, grouped by user and training lesson, each ordered from the most recent lesson date to the oldest date.

2	
- 2	
4	
-4	
-3	
0	
2	

Good luck!