|  |  |
| --- | --- |
| Q1 (25) |  |
| Q2 (10) |  |
| Q3 (20) |  |
| Q4 (15) |  |
| Q5 (10) |  |
| Bonus (5) |  |
| Q5 (20) |  |
| Total |  |

Final Exam

CSCE 520 – Summer 2015

Name:

Major:

Answer the following questions. Be brief and precise. You have 2 hour 30 minutes to finish the test. **Undergraduate students** must answer questions **1,…, 5; graduate students** must answer **additional question 6** for full credit.The bonus question is open for everyone.

**1. 25 points – ER model**

(10) Consider a ***Banking database*** where customers may have a single saving account and multiple checking accounts. Also, each customer may be a member of several banks. *Customers* have customer\_id, customer\_name, city, and phone attributes. *Accounts* have account\_number and current\_balance. *Saving accounts* have interest, *Checking accounts* have minimum\_balance and a fee amount if the balance goes below the minimum. *Banks* have attributes name and address.

(5) Transform your E-R model into *relation schemas*.

(5) Using the relation schemas you created, write a *relational algebra constraint* to disallow the Customers to have checking account without a saving account.

(5) Write an SQL query that returns the customer’s id and name of each customer who *lives in Columbia and have more than 1 checking account*.

**2. 10 points – FD equivalency**

(5) Consider the sets S1 and S2 of functional dependencies.

S1={A🡪C, AC🡪D, E🡪AD, E🡪H}

S2={A🡪CD, E🡪AH}

Claim: S1 is equivalent to S2*. The claim is TRUE / FALSE* (choose one)

Justify your answer:

**3. 20 points – 3NF**

(5) Define:

Super key:

Candidate key:

Primary key:

(15) Consider the following relation **R(A, B, C, D, E)** and FD’s **1) E 🡪 AD, 2) A🡪 B,** and **3) B 🡪 E**

List the***candidate keys of R****.* (Show your calculation of the keys or describe your logic.)

Decompose R into 3NF.

Does your decomposition ***remove all redundancies***? Justify your answer!

**4. 15 points – SQL queries**

Write SQL queries using the database schema for World War II Ships:

**Classes**(class, type, country, numGuns, bore, displacement)

**Ships**(name, class, launched)

**Battles**(name, date)

**Outcomes**(ship, battle, result)

Query 1: List for each class the number of ships of that class that was sunk in a battle.

Query 2: For each battle, list the number of ships that were launched before the battle, and the number of ships that were either sunk or damaged in the battle.

**5. 10 points – PL/SQL**

Consider the relations R(A, B, C) and S(C, D) and the view:

*create view data\_ACD as select A, C, D from R, S where R.C = S.C;*

Assume the users are permitted to insert new tuples into the *data\_ACD* view. Complete the following trigger definition to support view update:

*create trigger Update\_R\_and\_S*

*instead of \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_*

*referencing\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_*

*for each\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_*

*begin*

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(BONUS QUESTION)

1. **5 points –** Describe what *aspects* of the database application you need to consider when deciding the attributes to use as indexes. Why?

**5. Graduate students only! 20 points**

(5) Explain what the problems is if a *virtual view* is updated.

(10) Consider the database schema for World War II Ships:

**Classes**(class, type, country, numGuns, bore, displacement)

**Ships**(name, class, launched)

**Battles**(name, date)

**Outcomes**(ship, battle, result)

*Create a view* that for each country, lists the battles and the date of the battle if a ship of the country was sunk in the battle.

(5) Explain what are the *advantages and disadvantages* of using database *indexes*.