|  |  |
| --- | --- |
| 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)*Design a database* that keeps information about the drinkers (name, phone, city\_of\_residence), beers (name, manufacturer, type, rank), and bars (name, city, capacity, license\_number). We also want to represent the relationships between the bars and the beer and its price sold by the bars; and the relationship between the drinkers and the bars they frequent. Each bar also gives out VIP (very important person) certificates with levels (e.g., iron < bronze < silver < gold < platinum) to the drinkers based on the total number of drinks each drinker consumed in the bar. Show the ER model of the database.

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

(5) Using the relation schemas you created, write a *relational algebra constraint* to disallow the bars in Columbia to sell beers with ranking lower than 5.

(5) Using the relation schemas you created, write an *SQL query* to list each bar with the capacity that is twice of the total number of platinum level VIP customers who frequent that bar.

**2. 10 points – Transactions**

(5) Briefly describe the *ACID properties* of transactions.

**A**

**C**

**I**

**D**

(5) If you want to ensure *correct execution of concurrent transactions*, what isolation level would you choose? Why?

**3. 20 points – BCNF**

(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 BCNF.

Is your decomposition ***dependency preserving***? 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**

Write a procedure **No\_More\_Bud()** that searches the *Sells* relation and replaces every occurrence of BUD with Hopsecutioner and doubles the price that was charged for BUD. Complete the PL/SQL code using a cursor to get the name and price values from the Sells(bar, beer, price) relation:

CREATE OR REPLACE PROCEDURE No\_More\_Bud() AS

theBeer Sells.beer%TYPE;

thePrice Sells.price%TYPE;

CURSOR c IS

;

BEGIN

OPEN c;

LOOP

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(BONUS QUESTION)

**5 points –** What is a *trigger* and why is it frequently used in databases? **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*.