The City College of New York
Department of Computer Science
Fall 2021 Semester

CSc 33600 Introduction to Database Systems

Assignment 2

A report in PDF or MS Word uploaded on the Blackboard's course page for section showing [1] *the problem,* [2] *solution methods,* [3] *codes developed, and* [4] *outputs produced for the queries indicated, is due at or before* 11:00 *pm on Wednesday*, 27 October 2021. ***The deadline is strictly observed****.*

A demonstration of your application is required.

Family Relations - II

Consider the Family Entity-Relationship (E-R) diagram[s] discussed in the class.

A. The definition of a brother-in-law in the Cambridge English Dictionary[1] is:

a. The husband of a person's sister,
b. The brother of a person's wife or husband, or
c. The husband of the sister of a person's wife or husband

Given the relation **Brothers** that has tuples of the form (*c*, *d*), where *c* is the brother of *d*, the relation **Sisters** that consists of tuples of the form (*g*, *h*), where *g* is the sister of *h*, the relation **Brother-Sister** which has tuples of the form (*e*, *f*), where *e* is the brother and *f* is the sister, and the relation **Husband-Wife** that has tuples of the form (*a*, *b*), where *a* is the husband and *b* is the wife: [2]

a. Describe how you would define the relation **Brother-in-Law** whose tuples have the form (*x*, *y*) with *x* being the brother-in-law of *y*.
b. Give appropriate relational algebra-tree and SQL expressions that produce the relation **brother-in-Law**.
c. Amend your implementation in **Assignment 1** by including an implementation of the **brother-in-law** relation. The data utilized, whether your own personal data or available elsewhere, must be representative and sufficient to demonstrate the validity of your queries.

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[1] https://dictionary.cambridge.org/us/dictionary/english/brother-in-law.

[2] Note that the tuples (*c*, *d*) and (*d*, *c*) in **Brothers**, and (*g*, *h*) and (*h*, *g*) in **Sisters,** are different.

B. Design and implement a Java application that connects to the database. The application employs a the following class inheritance hierarchy:

Person;
Child *extends* **Person**;
Nephew *extends* **Child**;
Grandparent *extends* **Person**;
BrotherInLaw *extends* **Person**.

class Person:

Class **Person** is the hierarchy's superclass and extends the Java class **Object.** Class **Person** implements an **interface SQLFamilyRealtions**. A **Person** object is defined by the attributes of the Persons entity set in the Family E-R diagram, and may include an additional instance variable – *type* – indicating the type[s] of person[s] obtained from the queries executed. The class includes appropriate constructors and methods, including methods that perform the following operations:

a. *getRecord* – retrieves a **Person** object from the database;
b. *setRecord* – inserts a **Person** object into the database;
c. *getXPerson* – returns attribute [*X*] of a **Person** object; and
d. *toString* – returns a **Person** object description as a String. The method overrides the method *toString* in **Object**.

class Child, **Grandparent**, **BrotherInLaw***;* **class Nephew**:

Classes **Child**, **GrandParent**, and **BrotherInLaw** extend class **Person**; while class **Nephew** extends class **Child**. The classes include appropriate constructors and methods, including methods that perform the following operations:

a. *getChildren, getGrandparents, getBrothersInLaw* – execute relevant queries and return lists of the persons who are the children, grandparents, or brothers-in-law of a given couple-person; and
b. *print* – prints the list of children, grandparents, or brothers-in-law of a given couple-person.

interface SQLFamilyRelations:

Interface **SQLFamilyRelations** is implemented by the superclass **Person**, and includes method signatures, static methods, and/or default methods appropriate for the execution of the DML statements and SQL queries associated with the database.

Best wishes

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11 October 2021