ECE PARIS
ÉCOLE D'INGÉNIEURS

Prénom : ..Lisa.....
NOM : .....GRIERE.....
Promotion :
Groupe : .....

Ink.

ING 4
Bases de données avancées (SI)
Devoir surveillé

12 décembre 2017
13:45 - 15:15
Durée : 01:30

Sujet proposé par :	BUSCA Jean-Michel
Calculatrice autorisée :	NON
Documents autorisés :	NON
Ordinateur autorisé :	NON

RAPPEL :

- NOM et Prénom de l'élève doivent être portés sur toutes les copies rendues.
- Les copies doivent être numérotées.
- Tous les appareils électroniques (téléphones portables, PDA, ordinateurs, montre connectée, etc.) doivent être éteints et rangés.
- **Toute erreur constatée sur le sujet doit être signalée sur la copie. Le correcteur en tiendra compte lors de la correction du devoir.**
- Il est interdit de communiquer.
- Toute fraude, ou tentative de fraude, qu'elle soit passive ou active, fera l'objet d'un rapport de la part du surveillant et sera sanctionnée par la note zéro, assortie d'une convocation devant le Conseil de discipline. Aucune contestation ne sera possible. Tous les documents et supports utilisés frauduleusement, devront être remis au surveillant.
- Les élèves ne sont pas autorisés à quitter la salle où se déroule l'épreuve moins de 45 minutes après le début de l'épreuve. Au-delà de ces 45 premières minutes, toute sortie est définitive (sauf dans le cas d'une épreuve durant plus de deux heures).

Advanced Databases SI INI – Exam

Duration: 1:30. No document, no electronic device allowed. The marking-scheme is tentative. Please clearly indicate the number of the question and the sub-question you are answering.

Throughout the exam, we consider the database of a school, which includes information about its courses, its students and their enrollments. The relational schema of the database is as follows:

`students(sid, sname, address, syear)`
: Student ID, name, address and year, e.g. syear = 4 for a 4th year student. Note: Two students may have the same name.

`courses(cid, cname, duration, cyear)`
: Course ID, name, duration, e.g. 30 hours, and year, e.g. cyear = 4 for a 4th year course. Note: Two courses may have the same name.

`enrolled(#sid, #cid, mark)`
: Student ID, course ID, and the final mark the student got in the course; mark is null if the exam was not taken yet. Note: new courses and new students might not have any enrollment yet.

1 SQL Queries (5 marks)

Write in **standard** SQL the queries that return the information below. Please note that any query that is not syntactically correct will be marked 0.

1. The name of the students who don't have any mark below 10
2. Same question as above, this time using the `group by` operator
3. The name of the students who are not enrolled in all the courses corresponding to their year
4. For each course, its name, the number of enrolled students and the highest mark in the course
5. For each year, the name of the courses with the longest duration

2 Conceptual Modeling (5 marks)

2.1 Enrolled as a Relationship

Draw the Entity/Relationship diagram of the database, representing the `enrolled` table as a relationship.

2.2 Enrolled as an Entity Set

Draw again the Entity/Relationship diagram of the database, this time representing the `enrolled` table as an entity set.

2.3 Translation Rules

Briefly state the rules that applies when converting both diagrams to a relational schema and show that you get the same schema.

3 Java DataBase Connectivity (5 marks)

Consider the following class:

```
public class DataAccess {

      private Connection connection;

      public DataAccess(String url, String login, String password)
         throws SQLException {
            connection = DriverManager.getConnection(url, login, password);
      }

      public List<Float> getMarks(int year) throws SQLException {
            // returns the marks of the students of the specified year
      }

      public List<Float> addMark(int sid, int cid, float mark)
            throws SQLException {
            // add the specified mark for the specified student and course
      }

}
```

3.1 getMark()

Develop the `getMarks()` method using simple statements. You may modify the `DataAcces` class if needed.

3.2 addMark()

Develop the `addMark()` method using prepared statements. You may modify the `DataAcces` class if needed.

4 MongoDB (5 marks)

We assume that the database is now stored in MongoDB and that the courses are stored in a dedicated collection named `courses`. As an example, the document that describes the Advanced Databases course is as follows: {_id: 'INF413', name: 'Advanced Databases', duration: 30, year: 4}.

Write the MongoDB queries that return the information below.

1. the highest course duration
2. the name of 3rd year courses
3. the total duration of courses for each year
4. the highest of the per-year course total durations
5. the 4th year courses whose name contains two 'd' characters

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