CS1555 Recitation 2 - Solution

Objective: To practice the relational model and SQL DDL

Consider the following relation schemas and states:

Student ( SID, Name, Class, Major)

Student\_Dir ( SID, Address, Phone)

Courses\_taken ( Course\_No, Term, SID, Grade)

Course( Course\_No, Name, Level)

1. What are the arities and cardinalities of the relations?

**Student**

|  |  |  |  |
| --- | --- | --- | --- |
| SID | Name | Class | Major  Arity = 4  Cardinality = 4 |
| 123 | John | 3 | CS |
| 124 | Mary | 3 | CS |
| 126 | Sam | 2 | CS |
| 129 | Julie | 2 | Math |

**Student\_Dir**

Arity = 3

Cardinality = 3

|  |  |  |
| --- | --- | --- |
| SID | Address | Phone |
| 123 | 333 Library St | 555-535-5263 |
| 124 | 219 Library St | 555-963-9635 |
| 129 | 555 Library St | 555-123-4567 |

**Course**

|  |  |  |
| --- | --- | --- |
| Course\_No | Name | Course\_level |
| CS1520 | Web Programming | UGrad  Arity = 3  Cardinality = 5 |
| CS1555 | Database Management Systems | UGrad |
| CS1550 | Operating Systems | UGrad |
| CS 1655 | Secure Data Management and Web Applications | Ugrad |
| CS2550 | Database Management Systems | Grad |

**Course\_taken**

|  |  |  |  |
| --- | --- | --- | --- |
| Course\_No | Term | SID | Grade  Arity = 4  Cardinality = 11 |
| CS1520 | Fall 18 | 123 | 3.75 |
| CS1520 | Fall 18 | 124 | 4 |
| CS1520 | Fall 18 | 126 | 3 |
| CS1555 | Fall 18 | 123 | 4 |
| CS1555 | Fall 18 | 124 | NULL |
| CS1550 | Spring 19 | 123 | NULL |
| CS1550 | Spring 19 | 124 | NULL |
| CS1550 | Spring 19 | 126 | NULL |
| CS1550 | Spring 19 | 129 | NULL |
| CS2550 | Spring 19 | 124 | NULL |
| CS1520 | Spring 19 | 126 | NULL |

2. Find the primary key of each relation, assuming that a student is allowed to take each course only once.

Student: (SID)

Student\_Dir: (SID)

Course: (Course\_no)

Course\_taken: (Course\_no, SID)

3. Now given that a student may re-take a course if she or he fails to obtain a proper grade for that course, what is the primary key of the Course-taken relation?

(Course\_no, SID, term)

4. Find the foreign key(s) of each relation, if any. Where does each foreign key reference to?

FK1: Student\_Dir(SID) references Student (SID)

FK2: Course\_Taken(SID) references Student (SID)

FK3: Course\_Taken(Course\_No) references Courses (Course\_No)

5. Use CREATE TABLE statement to create tables for each of the relations above. You need to define the primary keys, foreign keys and any other constraints.

CREATE TABLE student (

sid char(5) NOT NULL,

name varchar(15) NOT NULL,

class int,

major varchar(10),

CONSTRAINT pk\_student PRIMARY KEY(sid) );

CREATE TABLE student\_Dir (

sid char (5) NOT NULL,

address varchar(100),

phone varchar(20),

CONSTRAINT pk\_student\_Dir PRIMARY KEY (sid),

CONSTRAINT fk\_student\_Dir FOREIGN KEY (sid) REFERENCES student(sid)

ON DELETE CASCADE ON UPDATE CASCADE);

CREATE TABLE course (

course\_no varchar(10) NOT NULL,

name varchar(100),

course\_level varchar(10),

CONSTRAINT pk\_Course PRIMARY KEY (course\_no));

CREATE TABLE course\_taken (

course\_no varchar(10) NOT NULL,

term varchar(15) NOT NULL,

sid char(5) NOT NULL,

grade numeric,

CONSTRAINT pk\_course\_taken PRIMARY KEY(course\_no, sid, term),

CONSTRAINT fk\_1\_course\_taken FOREIGN KEY (sid) REFERENCES student(sid)

ON DELETE CASCADE ON UPDATE CASCADE,

CONSTRAINT fk\_2\_course\_taken FOREIGN KEY (course\_no)

REFERENCES Course(course\_no) ON DELETE CASCADE ON UPDATE CASCADE);

6. What will happen if the first two CREATE TABLE statements are switched. Will the statements run smoothly without a problem?

No. An error will be thrown saying that the STUDENT table does not exist.

7. Would the following actions be valid given the current data? If not, why?

* Add a tuple <CS1550, Spring 19, 130, NULL> to course\_taken

No. FK2 would be violated since there is no student of SID 130 in Student.

* Delete the tuple <CS1520, Spring 19, 126, NULL> from course\_taken

Yes.

* Delete the tuple <123, John, 3, CS> from Student

No. FK2 and FK1 would be violated because there are tuples in Course\_Taken and in Student\_Dir having SID = 123.

* Delete the tuple <123, John, 3, CS> from Student, with foreign keys referring to SID in the Student table are declared with the “on delete cascade” option

Yes. It would be valid if the foreign keys FK1 and FK2 are declared with the “ON DELETE CASCADE” option. The tuples for John in Student\_Dir and Course\_Taken will also be deleted.

* Delete the tuple <123, 333 Library St, 555-535-5263> from Student\_Dir

Yes.

* In the table Course, update the name of the course CS1520 to Java Programming

Yes.

* In the table Course, update the course\_no of the course CS1520 to CS6666

No. FK3 would be violated.

* In the table Course, update the course\_no of the course CS1520 to CS6666, with foreign keys referring to Course\_No in Course table are declared with the “on update cascade” option

Yes. It would be valid if the foreign key FK3 is declared with the “ON UPDATE CASCADE” option. The course\_no for CS1520 in the Course\_Taken table will also be updated to CS6666.