CS1555 Recitation 5 - Video

Objective: To practice more relational model concepts and relational algebra, especially aggregations, joins, and division.

Consider the following relation schemas and states:

Student (SID, Name, Class, Major)

Student\_Dir (SID, Address, Phone)

FK: (SID) → Student (SID)

Course (Course\_No, Name, Level)

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

FK: (Course\_No) → Course (Course\_No)

FK: (SID) → Student (SID)

**Student**

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

**Student\_Dir**

|  |  |  |
| --- | --- | --- |
| 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 | Course\_Name | Course\_level |
| CS1520 | Web Programming | UGrad |
| CS1555 | Database Management Systems | UGrad |
| CS1550 | Operating Systems | UGrad |
| CS1655 | Secure Data Management and Web Applications | UGrad |
| CS2550 | Database Management Systems | Grad |

**Course\_taken**

|  |  |  |  |
| --- | --- | --- | --- |
| Course\_No | Term | SID | Grade |
| CS1520 | Fall 19 | 123 | 3.75 |
| CS1520 | Fall 19 | 124 | 4 |
| CS1520 | Fall 19 | 126 | 3 |
| CS1555 | Fall 19 | 123 | 4 |
| CS1555 | Fall 19 | 124 | NULL |
| CS1550 | Spring 20 | 123 | NULL |
| CS1550 | Spring 20 | 124 | NULL |
| CS1550 | Spring 20 | 126 | NULL |
| CS1550 | Spring 20 | 129 | NULL |
| CS2550 | Spring 20 | 124 | NULL |
| CS1520 | Spring 20 | 126 | NULL |

**Part 1: Relational Model**

1. For each of the relational algebra queries below:
   1. Identify the expected arity, schema, and min/max cardinality of the relation resulted from the below queries, without actually evaluating the query and based only on the schemas and cardinalities of the 4 given relations.
   2. Find the resulted relation given the above states of the relations.

(Note: we are using |T| notation to denote the Arity of relation T and |r(T)| notation to denote the cardinality of relation T)

a. Course\_No ( Term = 'Spring 20' (Courses\_taken ))

b. T3 Courses\_taken \* Course

c. T4 Courses\_taken ▷◁Courses\_taken.Course\_No = Course.Course\_No Course

**Part 2: Relational Algebra**

Write a relational algebra query for each of the queries below:

1. List the SID of the students who did not enroll in any course in Fall 19.
2. Find the total number of students.
3. Find the total number of students who have enrolled in the course “Operating Systems”
4. List the SID, name, and address (if available) of all students.