B0B36DBS, BD6B36DBS: **Database Systems**

http://www.ksi.mff.cuni.cz/~svoboda/courses/182-B0B36DBS/

Practical Class 9

Relational Algebra

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Database Schema

Assume we have the following schema of a relational database for a simple **student information system**

Student (id, name, address)

Teacher (id, name, phone, department)
department ⊆ Department (name)

Department (name, chair)
chair ⊆ Teacher (id)

Course (code, title, annotation)

Dependency (course, requisite)
course ⊆ Course (code), requisite ⊆ Course (code)

Schedule (course, teacher, semester, day, time, room)
course ⊆ Course (code), teacher ⊆ Teacher (id), room ⊆ Room (number)

Room (number, building, capacity)

Enrollment (student, semester, code, result)
student ⊆ Student (id), code ⊆ Course (code)

Exercise 1

Express the following RA query

- **Names of teachers from department *KSI***

Teacher (id, name, phone, department)
department $\subseteq$ Department (name)

Department (name, chair)
chair $\subseteq$ Teacher (id)

Exercise 2

Express the following RA query

- **Study results of a student with identifier *4301* from the previous semester (*181*)**
  - Return course codes, names, and the actual results

Student (id, name, address)

Course (code, title, annotation)

Enrollment (student, semester, code, result)
student $\subseteq$ Student (id), code $\subseteq$ Course (code)

Exercise 3

Express the following RA query

- **Names of teachers from all departments that have *Tomas Skopal* as their chief**

Teacher (<u>id</u>, name, phone, department)
department ⊆ Department (name)

Department (<u>name</u>, chair)
chair ⊆ Teacher (id)

Exercise 4

Express the following RA query

- **Codes and titles of all courses that are taught on *Mondays* or *Fridays* during this semester (*182*)**

Course (code, title, annotation)

Schedule (course, teacher, semester, day, time, room)
course ⊆ Course (code), teacher ⊆ Teacher (id), room ⊆ Room (number)

Exercise 5

Express the following RA query

- **Codes and titles of all courses that are not taught on *Mondays* and nor *Fridays* during this semester (*182*)**

Course (code, title, annotation)

Schedule (course, teacher, semester, day, time, room)
course ⊆ Course (code), teacher ⊆ Teacher (id), room ⊆ Room (number)

Exercise 6

Express the following RA query

- **Students without any enrolled course this year (semesters *181* and *182*)**
  - Return student names and addresses

Student (id, name, address)

Enrollment (student, semester, code, result)
student ⊆ Student (id), code ⊆ Course (code)

Exercise 7

Express the following RA query

- **Identifiers of students who have enrolled in all the courses that are taught during this semester (*182*)**

Schedule (course, teacher, semester, day, time, room)
course ⊆ Course (code), teacher ⊆ Teacher (id), room ⊆ Room (number)

Enrollment (student, semester, code, result)
student ⊆ Student (id), code ⊆ Course (code)

Exercise 8

Express the following RA query

- **Names of teachers who have time conflicts in their schedules for the next semester (*191*)**
  - Two events are in a conflict if…
    - they have overlapping times, but also
    - when there is less than *15* minutes for a break / *60* minutes for a transfer in case of events scheduled in rooms within the same building / in different buildings respectively
  - Assume that each event is *90* minutes long

Teacher (id, name, phone, department)
department ⊆ Department (name)

Schedule (course, teacher, semester, day, time, room)
course ⊆ Course (code), teacher ⊆ Teacher (id), room ⊆ Room (number)

Room (number, building, capacity)