min/max: 5b/10b, time: 20 min

`Name and surname, student number`

Task [1] (2 points)

Let us have two relations `R1(a, b, c)` and `R2(a, b, d)`. What is the result of the following relational algebra query: $\pi_{c,b}\ \sigma_{(a='Ivan')}\ R1 \bowtie \pi_{b,d}\sigma_{a='Vu'}\ R2$?

a	b	c
Tony	Barel	26
Tony	Koule	98
Ivan	Barel	36
Ivan	Barel	42
Ivan	Datel	77
Petr	Houba	84
Petr	Jistí	23
Petr	Jistí	28

Tabulka 1: R1

a	b	d
Tony	Barel	13
Ivan	Barel	56
Ivan	Humr	30
Vu	Barel	10
Vu	Barel	15
Vu	Jistí	59

Tabulka 2: R2

Task [2] (2 points)

Let us have entity types `Student`, `Subject` and relationship `Study(Student, Subject)`. We create corresponding tables and enter a data into it. Now we want to delete a row of the `Student` table, but SQL Server respond with the following message:

```
The DELETE statement conflicted with the REFERENCE constraint 'FK__xxx'. The conflict occurred in database 'login', table 'dbo.study', column 'login'.
```

Where is the problem? How it is possible to solve it without a database schema change?

Task [3] (3 points)

Let us have two relations `R1(a, b)` and `R2(a, c)` and two similar SQL queries:

R1:

a	b
x	5
y	6
z	6

R2:

a	c
x	1
x	null
z	1
z	1

S1:
```
SELECT R1.a, COUNT(R2.c) cnt FROM R1
LEFT JOIN R2 ON R1.a = R2.a
GROUP BY R1.a
```

S2:
```
SELECT R1.a, COUNT(R2.c) cnt FROM R1
JOIN R2 ON R1.a = R2.a
GROUP BY R1.a
```

Write the result for queries S1 and S2.

Task [4] (3 points)

Find all elementary functional dependencies that are valid on this relation and they have just one attribute on the left side.

a	b	c
Greg	F1	Ostrava
Peter	F1	Ostrava
Thomas	R2D2	Ostrava
Adam	3CPO	Paris
Alex	X2	Paris
David	X2	Paris

comment: use just the functional dependency definition.
