

RELATIONAL ALGEBRA

1. COLLEGE

Consider the following database of the grades obtained in the various exams taken by students in the curricular units of one or more courses, with the following tables and instances:

ALUNO	
<u>nr</u>	Nome
100	João
110	Manuel
120	Rui
130	Abel
140	Fernando
150	Ismael

PROF	
<u>sigla</u>	Nome
ECO	Eugénio
FNF	Fernando
JLS	João

CADEIRA			
<u>cod</u>	Design	curso	regente
TS1	Teoria dos Sistemas 1	IS	FNF
BD	Bases de Dados	IS	ECO
EIA	Estruturas de Informação e Algoritmos	IS	ECO
EP	Electrónica de Potência	AC	JLS
IE	Instalações Eléctricas	AC	JLS

PROVA

nr	cod	data	nota
100	TS1	92-02-11	8
100	TS1	93-02-02	11
100	BD	93-02-04	17
100	EIA	92-01-29	16
100	EIA	93-02-02	13
110	EP	92-01-30	12
110	IE	92-02-05	10
110	IE	93-02-01	14
120	TS1	93-01-31	15
120	EP	93-02-04	13
130	BD	93-02-04	12
130	EIA	93-02-02	7
130	TS1	92-02-11	8
140	TS1	93-01-31	10
140	TS1	92-02-11	13
140	EIA	93-02-02	11
150	TS1	92-02-11	10
150	EP	93-02-02	11
150	BD	93-02-04	17
150	EIA	92-01-29	16
150	IE	93-02-02	13

The key of the PROVA table is composed of the attributes nr, cod and data, allowing the storage of the result of more than one exam per unit. Assume that all students enrolled in a unit have taken at least one exam for that unit. Specify in relational algebra the answer to the questions below.

1. What are the student numbers?
2. What is the code and name of the units of 'AC' course?
3. Are there common names for students and teachers? Which ones?
4. What are the specific names of students, i.e. that no professors have?
5. What are the names of people related to the faculty?
6. What are the names of students who have taken any 'ts1' exam?
7. What are the names of the students with 'IS' course enrollment?
8. What are the names of the students who completed the course 'IS'?
9. What is the maximum grade in the exams?
10. What is the average grade on the BD exams?
11. What is the number of students?
12. What is the number of curricular units in each course?
13. What is the number of exams for each student?
14. What is the average number of exams per student?
15. What is the name and current average grade (units taken, in any course) of each student?
16. What is the maximum grade for each unit and which student got it?
17. Obtain the ordered list by course of the names of the graduated students.

[Baseado num exercício de Gabriel David]