

Data Management Coursework Year 1

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1 Relational Model

ex4

Faculties

FACULTIES(faculty,building,room,capacity,lecturer_email,lecturer_firstname,lecturer_surname)

Students

STUDENTS(student firstname,student surname,student id,student email,year,address,contact number,module id,module name,leader,
lecturer1,lecturer2,exam mark,coursework1,coursework2,coursework3)

ex5

Faculties

*lecturer_email → lecturer_firstname
lecturer_email → lecturer_surname
lecturer_email → faculty*

building, room → capacity

Students

*studentid → studentfirstname
studentid → studentsurname
studentid → studentemail
studentid → year
studentid → contactnumber
studentid → moduleid*

*moduleid → modulename
moduleid → leader
moduleid → lecturer1
moduleid → lecturer2
moduleid → coursework1
moduleid → coursework2
moduleid → coursework3*

studentid, module → exammark

ex6

Faculties candidate keys

lecturer_email, building and room is the primary key because it is used for only one lecturer within the faculty, although they may teach in multiple rooms.

Students candidate keys

student_id and module_id is the primary key because it corresponds to only one student, although they may be enrolled on multiple modules.

2 Normalisation

ex7

Required for first normal form

- Elements are atomic
- No repeating groups

Making the data first normal form

The faculties relation is already in first normal form because every relation is atomic (each element is only one piece of data) and there are no repeating groups (each column is unique). We can keep our relation:

FACULTIES(faculty,building,room,capacity,lecturer_email,lecturer_firstname,lecturer_surname)

However, the students relation is not first normal form. Firstly, the address column is not atomic because it contains the postcode and street name. Secondly, there are repeated groups. The lecturer columns are repeated (lecturer1, lecturer2) and the coursework columns are repeated (coursework1, coursework2, coursework3). Therefore, we need a new set of minimal functional dependencies:

STUDENTS(student_firstname,student_surname,student_id,student_email,year,address,contact_number,module_id)

MODULES(module_id, module_name, leader)

STUDENTMODULES(student_id, module_id, exam_mark)

LECTURERMODULES(lecturer_email, module_id)

COURSEWORKMARKS(student_id, coursework_id, module_id, mark)

ex8

Partial-key dependencies

A partial key is when one of the non-key columns depends on only a part of a composite key. There are partial-key dependencies in our data:

- $building, room \rightarrow capacity$
- $lecturer_email \rightarrow lecturer_firstname, lecturer_surname$
- $building \rightarrow faculty$
- $lecturer_email \rightarrow faculty$

Required for second normal form

- No partial key dependencies (as described above)

Our data in second normal form

FACULTIES(faculty)

BUILDINGS(building, faculty)

ROOMS(building, room, capacity)

LECTURERS(lecturer_email,lecturer_firstname,lecturer_surname)

LECTURERFACULTY(lecturer_email, faculty)

3 Modelling

4 Querying