Tutorial: Calculus with a pinch of Algebra

This tutorial uses the schema of the database in Tutorial 1.

1. Translate the following queries into tuple relational calculus (TRC).
   (a) Find the different departments in School of Computing.
   (b) Let us check the integrity of the data. Find the emails of the students who borrowed or lent a copy of a book before they joined the university. There should not be any.
   (c) Print the emails of the students who borrowed but did not lend a copy of a book on the day that they joined the university.
   (d) Find the ISBN13 of the books that have been borrowed by all the students in the computer science department.
2. Translate the following queries into relational algebra.
   (a) Find the different departments in School of Computing.
   (b) Let us check the integrity of the data. Find the emails of the students who borrowed or lent a copy of a book before they joined the university. There should not be any.
   (c) Print the emails of the students who borrowed but did not lend a copy of a book on the day that they joined the university.

References

[1] S. Bressan and B. Catania. *Introduction to Database Systems.* McGraw-Hill Education, 2006.

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[3] R. Ramakrishnan and J. Gehrke. *Database Management Systems.* McGraw-Hill, 2002.