Tutorial: Functional Dependencies

Your company, Apasaja Private Limited, is commissioned by an online company offering several services to design the relational schema the management of their users' profiles. A service is fully described and identified by its name. Each user can register to one or more services. A user is uniquely identified by her email as well as by her mobile number. Each user has both a postal address and a country of residence. The postal address, however, unambiguously identifies the country in which it is located. There can be several users with the same address.

We are only given an abstract schema for this application as follows.

$R = \{A, B, C, D, E\}$

$\Sigma = \{\ \{A\} \to \{A, B, C\},\ \ \{A, B\} \to \{A\},\ \ \{B, C\} \to \{A, D\},\ \ \{B\} \to \{A, B\},\ \ \{C\} \to \{D\}\ \}$

Questions

Not all questions will be discussed during tutorial. You are expected to attempt them before coming to the tutorial. You may be randomly called to present your answer during tutorial. You are encouraged to discuss them on Canvas Discussion.

1. **Functional Dependencies**.
   (a) From the functional dependencies in Σ and the text description of the application as well as the entity-relationship diagram and schema, can you figure out the mapping of the attributes and the letters?
   (b) Compute the attribute closures of the subset of attributes of R with Σ in order to find the candidate keys of R with Σ.
   (c) Find the prime attributes of R with Σ.
2. **Minimal Cover**.
   (a) Compute a minimal cover of R with Σ.
   (b) Compute a canonical cover of R with Σ.

References

[1] S. Bressan and B. Catania. *Introduction to Database Systems*. McGraw-Hill Education, 2006. ISBN: 9780071246507.

[2] Hector Garcia-Molina, Jeffrey D. Ullman, and Jennifer Widom. *Database Systems: The Complete Book*. 2nd ed. Prentice Hall Press, 2008. ISBN: 9780131873254.

[3] Raghu Ramakrishnan and Johannes Gehrke. *Database Management Systems*. 2nd. USA: McGraw-Hill, Inc., 2000. ISBN: 0072440422.