DATABASE SYSTEMS

TUTORIAL 10

Functional Dependencies

1. Given relation R(A,B,C,D,E) with dependencies

AB🡺C

CD🡺E

DE🡺E

Is AB a candidate key of relation R?

Is ABD a candidate key of relation R?

1. Consider the universal relation R = {A, B, C, D, E, F, G, H, I,J} for the following different set of functional dependencies FD =

G = {{A, B} 🡺 {C}, {B, D} 🡺 {E, F}, {A, D} 🡺 {G, H}, {A} 🡺 {I}, {H} 🡺 {J} }.

What is the key for R?

1. Compute the closure of the following set F of functional dependencies for relation

schema R = (A, B, C, D, E).

A🡺 BC

CD🡺 E

B🡺D

E🡺A

List all the candidate keys of relation R.

4. Consider a relation schema R=(A,B,C).  For each part below (note that each part is separate), supply a relation (table) T on R having just four rows and satisfying the given functional dependency (or dependencies) but NOT satisfying any other functional dependencies except trivial ones and those that are derivable from the given one(s). The values of the attributes in your rows should be lower-case letters with subscripts (e.g. a1, b3, c2).

* 1. A -> BC,  B -> C
  2. A -> BC
  3. AB -> C

5. Find the minimal cover of set of FDs as F = { AB -> C, C -> A, BC -> D, ACD -> B, D -> E, D -> G, BE -> C, CG -> B, CG -> D, CE -> A, CE -> G}

6. Let R(A,B,C,D,E) be a relation with FDs

AB🡪C, C🡪D, D🡪B,D🡪E

(a) Find the closures of D and AB

(b) Find all the keys for this relation. (you don’t need to list superkeys that are not keys.)

7. The following two questions refer to the relational scheme R (A, B, C, D, E , F, G, H)

and the following functional dependencies over R:

A --> BCD

AD ->E

EFG -> H

F ->GH

(a) Based on the functional dependencies, what is the key for R?

(b) Which of the four functional dependencies can be removed without altering the key?

8. Consider two sets of FDs, F and G, F = {A -> B, B -> C, AC -> D} and G = {A -> B, B -> C, A -> D} . Are F and G equivalent?

9. **Consider a schema R(A,B,C,D) and functional dependencies A->B and C->D. Is the decomposition of R into R1(AB) and R2(CD) is dependency preserving and lossless?**