**Superkey**

K is a superkey for R if for all tuples t1 and t2 in R, t1 ≠t2, t1[K] ≠ t1[K].

**A candidate key** is a minimal superkey.

**Functional dependency**

functional dependency if for all tuples t1, t2 in R, if then

**BCNF**

***R*** is BCNF with respect to ***F*** (a set of functional dependencies) if, for all functional dependencies in ***F+***, of the form

Decomposition scheme for where

**3NF**

***R*** is BCNF with respect to ***F*** (a set of functional dependencies) if, for all functional dependencies in ***F+***, of the form

* or
* each attribute in is contained in a candidate key for R.

1. Consider the relation EXAMS and a set *F* of functional dependencies:

PROJECTS(project\_id, manager\_id, team\_id, employee\_id, meeting\_day)

project\_id(manager\_id, team\_id)

(manager\_id, employee\_id)

(teem\_id, employee\_id)

1. Find a functional dependency that is inferred from the dependencies above. Find ***F+***
2. Find a superkey, find candidate keys.
3. Verify if EXAMS is in BCNF normal form. Decompose the relation to obtain BCNF relations.
4. Is the decomposition **lossless** and **dependency preserving**?
5. Give a 4NF decomposition for:
6. (restaurant, location, pizza\_type)
7. (student\_id, training\_id, optional\_course)