Functional dependencies

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1 Specification of functional dependencies

Let us have a relation `Movie(movie_name, year, duration, studio, actor_name, birth_date, id_residence, street, city)`, which store the information about particular movies, actors in movies and residences of actors. Decide, which of the following functional dependecies are correct. In the case of incorrectness explain it and find counterexample.

- `movie_name` → `duration studio`
- `movie_name year` → `duration studio`
- `studio` → `movie_name`
- `actor_name` → `birth_date id_residence`
- `movie_name actor_name` → `birth_date id_residence`
- `birth_date` → `street city`
- `id_residence` → `street city`
- `actor_name` → `street city`

2 Find the cover and define keys

Let us have the same relation `Movie(movie_name, year, duration, studio, actor_name, birth_date, id_residence, street, city)` and a set of functional dependencies:

- `movie_name year` → `duration studio`
- `actor_name` → `birth_date id_residence`
- `id_residence` → `street city`

Find the cover for these sets of attributes:

- year, actor_name
- birth_date
- movie_name, year, actor_name
- actor_name

Find the shortest key for the relation.

3 Minimal nonredundant functional dependencies

Let us have relational scheme $R(W, X, Y, Z)$ a set of functional dependencies:

- $W \rightarrow Z$
- $YZ \rightarrow X$
- $WZ \rightarrow YX$

Define redundant FD and redundant attributes in functional dependencies. In other words, define minimal set of nonredundant FD.