

Exercise 2

Relation, FD, and Keys

DBS

1. Translate the ER Diagram of Q1 in Exercise 1 to a set of relations.

2. Consider the following relational schema:

SINGER(id, name)

SONG(id, title, albumid)

SING(singerid, songid)

ALBUM(id, title, singerid)

USER(uid, name)

RATE_SONG(uid, songid, rating)

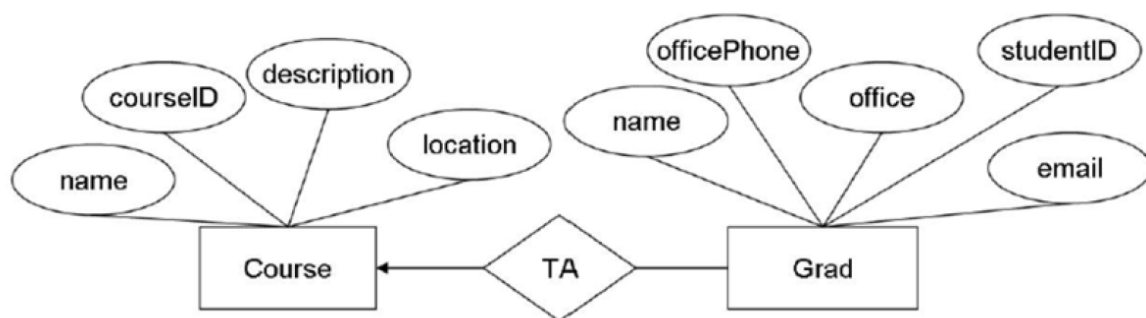
RATE_SINGER(uid, singerid, rating)

PLAY_SONG(uid, songid, datetime)

FOLLOW_USER(followeruid, followeeuid)

Construct an ER diagram that leads to the above schema.

3. Consider the following ER diagram, which describes graduate students (Grad) and courses (Course) they serve as Teaching Assistants (TA).



a) For each of the following statements, write a functional dependency (FD) that best captures the statement.

- The studentID of each graduate student uniquely identifies the student.
- No two offices have the same phone number (officePhone).
- No two courses have the same courseID.
- If two courses have the same course name, their course descriptions are the same.

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b) From the ER diagram and the set of FDs you listed above, can you derive new FDs? If no, explain why not. If yes, derive two non-trivial FDs.

4. Consider the relation ADDRESS having attributes Street, City, State and Zip. Assume that for any given zipcode, there is just one city and state. Also, for any given street, city, and state, there is just one zipcode.

(a) Infer all non-trivial functional dependencies (FDs) for this relation.

(b) Which are possible candidate keys?

5. Prove the following properties using Armstrong's axioms or reject it by counterexample relations.

(a) $A \rightarrow B \Rightarrow AC \rightarrow B$

(b) $A \rightarrow C \text{ and } AB \rightarrow C \Rightarrow B \rightarrow C$