

CS34800, Fall 2016, Assignment 3

Due 11:59pm 24 October, 2016

Problem 1. Consider the relation shown in the table below:

MovieID	Title	Rating	Genre
1	The Jungle Book	5	Animation
1	The Jungle Book	3	Animation
2	The Bicycle Thief	5	Drama
2	The Bicycle Thief	4	Drama
3	Doctor Zhivago	4	Drama
3	Doctor Zhivago	3	Drama
3	Doctor Zhivago	5	Drama

Answer the following questions:

- List the minimal set of the functional dependencies that this relation instance satisfies.
- Assume that the rating of “The Bicycle Thief” in the 4th row is changed from 4 to 3. List all the functional dependencies that the new relation instance satisfies.

Problem 2. Consider the following relation schema

Movies (MovieID, Title, Year, Genre, Rating)

and a set of functional dependencies defined on the relation:

{ MovieID \rightarrow Title, Genre \rightarrow Rating }

Answer the questions below:

- Identify the candidate keys for this relation with respect to the set of functional dependencies.
- Is the relation in BCNF? Justify your answer.
- Is the relation in 3NF? Justify your answer.
- Is the dependency: MovieID, Year \rightarrow Title a logical consequence of the given dependencies?
- Is the dependency: MovieID, Genre, Year \rightarrow Rating a logical consequence of the given dependencies?

Problem 3. Consider the schema of a relation R as (A, B, C, D). Prove (or provide a counterexample) if the following statement is TRUE or FALSE:

$AB \rightarrow CD$ logically implies $A \rightarrow C$.

Problem 4. Consider the following relational schema dealing with a set of libraries, members, and book issue requests. The underlined attributes represent the primary key for each schema.

Libraries (LibID, Name, City)

Members (MemberID, Name, Address, Gender, Age)

IssueRequests (IssueID, LibID, MemberID, BookISBN, IssueDate, ReturnDate)

Consider the following integrity constraints:

- i. A member cannot put different issue requests for a book on a certain date, i.e. a member cannot issue request for the same book more than once a day.
- ii. A library cannot have more than one issue request for a book from the same member.

Answer the following questions:

- a) Express the above constraints as functional dependencies on the **IssueRequests** relation;
- b) Is the **IssueRequests** relation in 3NF with respect to the functional dependencies identified in part (a)? If not, determine a 3NF decomposition of the relation.

Problem 5. Consider the following relational schema that stores information about events in cities. The underlined attribute represents the primary key for the schema.

Events (Title, Date, Location, City)

Assume that:

- i. Each event (identified by its Title and Date) is in a single location;
- ii. Each location is in a single city.

Answer the following questions:

- a) Specify the functional dependencies that characterize the given schema based on the two assumptions mentioned above.
- b) Determine whether the given schema is in 3NF with respect to the functional dependencies specified above; if not, write a 3NF decomposition for the schema.

Turning the assignment in

Please turn the assignment by uploading a PDF in [Blackboard](#). We prefer a typed/typeset answer. If you (clearly and readably) handwrite your answers, then turn in a (clear, readable) scan as a PDF. If you don't know of a way to generate a PDF, bring it up in PSO. Do **NOT** forget to write your name on your assignment document.