

DATA 225

Database Systems for Analytics

Fall 2023
Section 21
Instructor: Ron Mak

Assignment #4b

Assigned: Monday, September 18
Due: Monday, September 25 at 5:30 pm
Individual assignment, 115 points max

Normalization practice

The purpose of this assignment is to give you practice normalizing tables and creating tables with foreign key constraints.

1. Normalization exercise #1

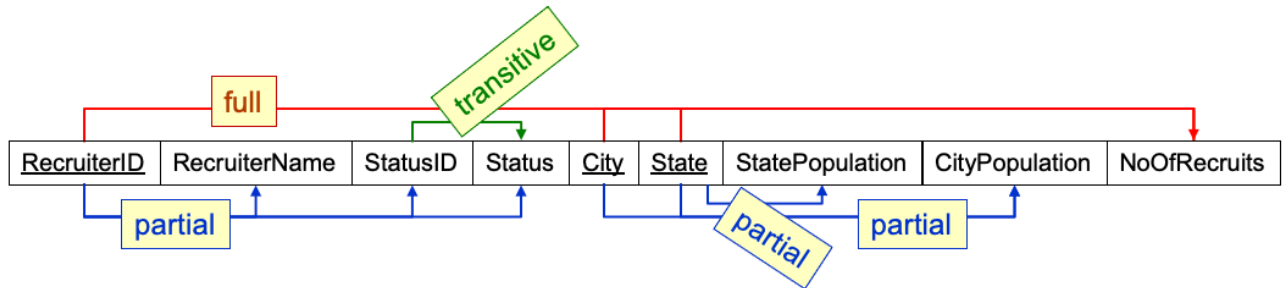
AIRPORT KLX TABLE

<u>Date</u>	<u>AirlineID</u>	<u>AirlineName</u>	<u>TerminalID</u>	<u>NumberOfGates</u>	<u>NumberOfDepartingFlights</u>
11-Dec	UA	United	A	20	34
11-Dec	NW	Northwest	A	20	17
11-Dec	AA	American	A	20	11
11-Dec	DL	Delta	B	15	20
11-Dec	JB	Jet Blue	B	15	6
12-Dec	UA	United	A	20	29
12-Dec	DL	Delta	B	15	20
12-Dec	SWA	Southwest	C	15	17

- The AIRPORT KLX TABLE captures the data about daily departing flights at the KLX Airport.
- Each airline operating at KLX Airport has a unique airline ID and airline name.
- Each terminal at KLX Airport has a unique terminal ID and a fixed number of gates.
- Each airline is permanently assigned to one and only one terminal at KLX Airport.
- Each terminal at KLX Airport can have multiple airlines assigned to it.
- Each day, this table records the number of departing flights at KLX Airport for each airline.

Problems:

- a. [5 points] Using the AIRPORT KLX TABLE, describe an example that illustrates the insertion anomaly.
- b. [5 points] Using the AIRPORT KLX TABLE, describe an example that illustrates the deletion anomaly.
- c. [5 points] Using the AIRPORT KLX TABLE, describe an example that illustrates the modification anomaly.
- d. [20 points] Identify full key functional dependencies, any partial functional dependencies, and any transitive functional dependencies. You can either do this in graphics form, for example:

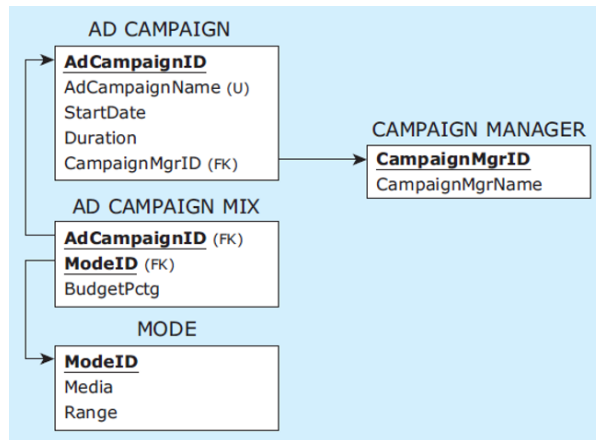


Or you can do this in text form, for example:

Partial: RecruiterID → RecruiterName, StatusID, Status
Partial: City, State → CityPopulation
Partial: State → StatePopulation
Full key: RecruiterID, City, State → NoOfRecruits
Transitive: StatusID → Status

See the September 18 slides #52 and #53.

- e. [20 points] Show the tables normalized to 3NF. For example:



f. [10 points] Use ERDPlus to create a relational schema diagram of the database by first creating an ER diagram and then mapping it to the relational schema. The relational schema should match your normalized tables (as in slides #49 and #50).

2. Normalization exercise #2

LANGUAGE SCHOOL TABLE

<u>CourseID</u>	<u>CourseLanguage</u>	<u>CourseLevel</u>	<u>ClientID</u>	<u>ClientName</u>	<u>Attendance</u>	<u>FinalScore</u>
10	German	Basic	C111	Mr. Smith	100%	80%
11	German	Intermediate	C222	Ms. Jones	90%	90%
12	German	Advanced	C333	Mr. Vance	95%	100%
10	German	Basic	C444	Ms. Clark	100%	100%
11	German	Intermediate	C555	Ms. Wong	90%	95%
12	German	Advanced	C666	Ms. Hess	95%	98%
20	Japanese	Basic	C111	Mr. Smith	100%	100%
21	Japanese	Intermediate	C222	Ms. Jones	95%	100%

- The LANGUAGE SCHOOL TABLE keeps track of clients completing language courses.
- Each course has a unique course ID and a course language and a course level.
- Each client has a unique client ID and a client name.
- Each course can be completed by multiple clients.
- Each client can complete multiple courses.
- When a client completes a course, his or her attendance and final score in the class are recorded.

Problems:

a. [20 points] Use graphics or text to depict full key functional dependencies, any partial functional dependencies, and any transitive functional dependencies.

b. [20 points] Normalize the table to 3NF. Show the structure of each new table in graphics or text form.

c. [10 points] Use ERDPlus to create a relational schema diagram of the database by first creating an ER diagram and then mapping it to the relational schema. The relational schema should match your normalized tables.

What to submit

For Part 1:

- Descriptions of the insertion, deletion, and modification anomalies.
- The partial, full key, and transitive functional dependencies in graphics or text form.
- The new normalized tables in graphics or text form.
- ER diagram and mapped relational schema from ERDPlus.

For Part 2:

- The partial, full key, and transitive functional dependencies in graphics or text form.
- The new normalized tables in graphics or text form.
- ER diagram and mapped relational schema from ERDPlus.

Rubric

Criteria	Max points
<ul style="list-style-type: none">• Exercise #1<ul style="list-style-type: none">a. Insertion anomaliesb. Deletion anomaliesc. Modification anomaliesd. Functional dependenciese. Normalized tablesf. ER diagram and mapped relational schema	<ul style="list-style-type: none">• 65<ul style="list-style-type: none">a. 5b. 5c. 5d. 20e. 20f. 10
<ul style="list-style-type: none">• Exercise #2<ul style="list-style-type: none">a. Functional dependenciesb. Normalized tablesc. ER diagram and mapped relational schema	<ul style="list-style-type: none">• 50<ul style="list-style-type: none">a. 20b. 20c. 10