

Exam 2016



Universiteit Maastricht

Q. 1: Entity Relationship Modeling

15 marks

Twitter Inc. has approached you to design its database. Here are the requirements/specifications of their system:

- Every Twitter account has a user id, screen name, password, start date, photo, number of followers, number of followees, and the number of posted Tweets.
- Every Twitter account may follow up to 5000 other Twitter accounts (followees). But the Twitter account may have unlimited number of followers.
- Every Twitter account may post any number of Tweets. Each Tweet should have an id, date, textual content, list of hashtags contained in it, number of retweets, and number of favorites (likes).
- Every Tweet can be retweeted. Retweets are considered new different Tweets.
- Tweets may have replies which are also considered new different Tweets.
- Each Tweet may have an attachment. This attachment may be an image or video file. Twitter Inc. needs to record the size of the attachment for storage purposes.
- In addition to retweets and replies, users may favorite (like) a Tweet.

Draw an entity relationship diagram for the Twitter's database. If you make further assumptions, please state and motivate them.

Q. 2: Relational Data Modeling

10 marks

Map the ER model you developed for Twitter Inc. in question number 1 to its proper Relational Data Model.

Q. 3: Extended Entity Relationship Modeling

15 marks

Symphonic Band is an orchestra that plays different types of concerts. The orchestra's popularity is growing fast and they are starting to have problems to keep track of the musicians that should play in each concert as well as the musical works that are most suitable for the concert. Help the orchestra to create a database model, as a first step to implement a database, so that the orchestra can keep track of both musicians and musical works. The database model must represent the following points:

- The orchestra plays three types of concerts: church concerts, private parties, and outdoor concerts.
- The orchestra plays three types of music: classical, popular, and American folk. The orchestra always plays classical music in their church concerts. The orchestra always plays American folk on private parties. Finally, the orchestra plays a blend of the three types of music when playing outdoor.
- It should be possible to find in the database the music works that are suitable for each type of concert so that the repertoire can be easily planned well in advance.
- For each musical work, the database should store which musical setting (i.e. The instruments) are required to play the work.
- The database should store information for each concert. The information should include the place, date and time of the concert as well as the type of concert and the repertoire that will be played.
- For each musician in the orchestra, the database should store his/her name, the instrument that he/she plays, and in which of the coming concerts he/she will participate.

Draw an extended entity relationship diagram for the orchestra's database. If you make further assumptions, please state and motivate them.

Q. 4: Relational Algebra

15 marks

Given the following relational database scheme for the Fifa (The Federation Internationale de Football Association):

- PLAYER(PlayerID, PlayerName, BirthDate, Nationality)
- CLUB(ClubName, Country)
- PLAYER_CLUB(PlayerID, ClubName, StartDate, EndDate)
- GAME(GameID, ClubName1, ClubName2, Date, Stadium)
- GOAL(GameID, PlayerID, Time)
- CARD(GameID, PlayerID, Time, CardType)

Write the following queries in relational algebra:

1. Find the names of the players who played for both 'Barcelona' and 'Real Madrid' during their football career.
2. Find the names of the players who scored a goal and got booked (got a card) on the same game.
3. Find the names of the players who never scored a goal in their life.
4. Find for each player name, the total number of goals he scored during his football career. Note: Final result should include a list of all players including those who didn't score any goals.
5. Find the names of the players who played for a club in their home country.

Q. 5: SQL Statements

20 marks

Consider the following relational scheme:

- customers(customerNumber, customerName, address)
- products(productCode, productName, productDescription, quantityInStock)
- orders(orderNumber,customerNumber, orderDate)
- orderdetails(orderNumber, productCode, quantityOrdered, priceEach)

Answer the following:

1. Write a SQL statement to create the products table. Assume the data types for the attributes.
2. Write a SQL statement to create the orderdetails table. Assume the data types for the attributes. Include the creation of the foreign keys in the create statement.
3. The system's end user is submitting many queries to search for customers by their name. Write the proper SQL statement which makes this search more efficient.
4. Write a SQL statement to add the column creditLimit to the customers table.
5. Write a SQL statement to return the order number and the total amount per order.
6. Write a SQL statement to list numbers and names of customers who made orders in 2015.
7. Write a SQL statement to return the total amount of all orders made in 2015.
8. Write a SQL statement to list customer's number, customer's name and his/her total number of orders. The list should contain all customers even if they made no orders at all.
9. Write a SQL statement to return the customer's number and customer's name who ordered products whose quantityInStock is less than 10.
10. Write a SQL statement to remove the orders table from the database such that it should be removed even if it is referenced by other tables.

Good Luck!