Exercise 1  We want to build a relational database about the domain of movies. In particular, we want to store information about movies (name, ID, year, director-ID, country), directors (name, ID, birthdate, nationality), actors (name, ID, birthdate, nationality). Moreover, a relation isDirectorOf (director-ID, movie-ID) stores information about the directors of movies, and a relation playsIn (actor-ID, movie-ID) stores information about the actors of movies.

1. Write SQL statements that define the schema of the above described database;
2. Write SQL statements that insert at least two tuples in each of the tables defined at the previous point;
3. Write SQL statements that express the following queries:
   (a) return the names of all the Italian directors;
   (b) return the names of the movies filmed in the U.S.A. and directed by Italian directors;
   (c) return the names of the actors who played in movies directed by Italian directors;
   (d) return the number of movies played by Robert De Niro.

Exercise 2

1. Define a file organization for the relations of the schema of Exercise 1 such that the execution of the SQL query relative to point (a) of Exercise 1 is optimized;
2. define a file organization for the relations of the schema of Exercise 1 such that the execution of the SQL query relative to point (c) of Exercise 1 is optimized.

Exercise 3

We want to store a multidimensional structure containing the following information about precipitations:

- quantity (number of millimeters)
- type (rain, snow, hail, sleet)

over the following dimensions:

- Time (hour, day, week, month, quarter, year)
- Location (city, region, country, continent)

1. Define a star schema to represent the above multidimensional structure;
2. define a snowflake schema that reduces on both dimensions the redundancy of the star schema defined at the previous point;
3. write an SQL query over the star schema defined at point 1 that returns the types of precipitations in Rome from January 2014 to June 2014;
4. write an SQL query over the snowflake schema defined at point 2 that returns the types of precipitations in Rome from January 2014 to June 2014;
5. write an SQL query over the star schema defined at point 1 that returns, for every Italian city, the quantity (number of millimeters) of snow that fell in that city from January 2000 to December 2015.

Exercise 4

(a) Write an RDF model representing the following statements about URIs Person, Director, Actor, Country, Movie, Comedy, Drama, Male, Female, filmedIn, isDirectorOf, actsIn, bornIn, Joe, Mary, Ann, Paul, Italy, France, ABC, XYZ.

1. Ann is the director of movie XYZ;
2. Joe and Paul act in movie ABC;
3. ABC was filmed in France;
4. Paul was born in Italy;
5. Ann is of type female;
6. Paul is of type male.

(b) Write SPARQL queries corresponding to the following requests: (b1) “return every comedy that was filmed in France by an Italian director; (b2) “return all the countries where at least one comedy and one drama were filmed”; (b3) “return the directors who directed at least one movie that was filmed in Italy or in France”.

Exercise 5

Consider the information requested in point 2 of Exercise 1. Express such an information using a graph database (e.g., Neo4J).

Exercise 6

Consider the information requested in point 2 of Exercise 1. Express such an information using a noSQL document data model (e.g., JSON).