Homework

1. What database models do you know?

- There are two main types of data models - relational and non-relational. Non-relational data models are the document model, the key-value model, the hierarchial key-value model, the wide-column model, the object model and so on.

2. Which are the main functions performed by a Relational Database Management System (RDBMS)?

- RDBMS typically implement creating, alterning, deleting tables and creating relationships between them. They also implement adding, changing, searchign and retreiving pieces of stored data. They support the SQL language and optionally - transaction management.

3. Define what is "table" in database terms.

- Table is a set of data elements using a model of vertical columns and horizontal rows. A table has a specified number of columns but can have any number of rows. Each row is identified by the values appearing in a particular column subset which has been identified as a unique key index.

4. Explain the difference between a primary and foreign key.

- The primary key uniquely identify a record in the table whole the foreign key is a field in the table that is also a primary key in another table. For this reason we can have only one primary key in a table but we can have multiple foreign keys in it.

5. Explain the different kinds of relationships between tables in relational databases.

- There are three main kind of relationships. The first and most typical one is "one-to-many". In this case a single record in a table has many corresponding records in another table. For example each country can have multiple towns. The second kind is "many-to-many". In this case the records in the first table have many corresponding records in the second table. We implement this relationship by using a third table. For example a student can attend many courses and a course can have many students. The third kind of relationship is "one-to-one". In that case a single record in a table corresponds to a single record in another table. It is used to model inheritance between tables. It is also possible a "self-relationship" to exist when the primary/foreign key relationship points to the same table.

6. When is a certain database schema normalized? What are the advantages of normalized databases?

- A base is normalized when the repeating data has been removed and replaced in most of the cases with certain unique identifiers. The main advantages of normalizing a database schema is easier modication and and altering of records in later stages and also lowering the amount of storage space required to store the data.

7. What are database integrity constraints and when are they used?

- Integrity constraints ensure data integrity in the database tables. They consist of various key constraints and check constraint. They are used when we want the values in certain column to

follow a specific rule. For example, the primary key constraint ensures that every cell has unique value.

8. Point out the pros and cons of using indexes in a database.

- The idexes speed up searching of values in a certain column or group of columns. Usually they are implementing as B-tree. The problem with their usage is that in order to keep the tree ballanced more time is required when tryign to insert or delete a record.

9. What's the main purpose of the SQL languge?

- SQL is a declarative language for manipulating relational databases.

10. What are transactions used for? Give an example.

- Transactions are used to guarantee the consistency and the integrity of the database. All the changes made in a transaction are temporary and become final only when all operations in it has been successfully executed. And example for it's usage is in a bank transfer when both actions - withdrawal and deposit should be done only together.

11. What is a NoSQL database?

- A NoSQL database is a non-relational database. It's main characteristic is the lack of schema.

12. Explain the classical non-relational data models.

- In those models the data is stored in documents (record). Every single document is a separate record and the documents don't have a fixed structure.

13. Give few examples of NoSQL databases and their pros and cons.

- Some of the most popular NoSQL databases are MongoDB, Redis, CouchDB, Cassandra. They all have great performance and scalability and they are also highly optimized for adding and retrieving data .