**Database Systems – Overview**

1. **What database models do you know?**
   1. Hierarchical (tree)
   2. Network / graph
   3. Relational (table)
   4. Object/Document-oriented
2. **Which are the main functions performed by a Relational Database Management System (RDBMS)?**
   1. Creating / altering / deleting tables and relationships between them (database schema)
   2. Adding, changing, deleting, searching and retrieving of data stored in the tables
   3. Support for the SQL language
   4. Transaction management (optional)
3. **Define what is "table" in database terms.**
   1. A table is a set of data elements (values) that is organized using a model of vertical columns (which are identified by their name) and horizontal rows, the cell being the unit where a row and column intersect.
4. **Explain the difference between a primary and a foreign key.**
   1. The foreign key is an identifier of a record located in another table (usually its primary key) and a primary key is a column of the table that uniquely identifies its rows (usually it’s a number).
5. **Explain the different kinds of relationships between tables in relational databases.**
   1. *One-to-many* – it represents a single record in the first table has many corresponding records in the second table and it’s used very often.
   2. *Many-to-many* – A single record in the first table has many corresponding records in the second table and A single record in the first table has many corresponding records in the second table.
   3. *One-to-one* – A single record in the first table has many corresponding records in the second table and it’s used to model inheritance between tables.
6. **When is a certain database schema normalized? What are the advantages of normalized databases?**
   1. Normalization of the relational schema removes repeating data and the advantages of it are smaller database and quicker database operations.
7. **What are database integrity constraints and when are they used?**
   1. Integrity constraints ensure data integrity in the database tables.
8. **Point out the pros and cons of using indexes in a database.**
   1. *Pro* – quick search operations.
   2. *Con* – slow add and remove operations.
9. **What's the main purpose of the SQL language?**
   1. Manipulation of relational databases a.k.a. Creating, altering, deleting tables and other objects in the database and Searching, retrieving, inserting, modifying and deleting table data (rows).
10. **What are transactions used for? Give an example.**
    1. A transaction comprises a unit of work performed within a database management system (or similar system) against a database, and treated in a coherent and reliable way independent of other transactions. The most simple example is the one given at the lecture - A bank transfer from one account into another (withdrawal + deposit). If either the withdrawal or the deposit fails the entire operation should be cancelled.
11. **What is a NoSQL database?**
    1. A NoSQL database, uses document-based model (non-relational) and is schema-free document storage.
12. **Explain the classical non-relational data models.**
    1. *Document model* – set of documents, e.g. JSON strings
    2. *Key-value model* – set of key-value pairs
    3. *Hierarchical key-value* – hierarchy of key-value pairs
    4. *Wide-column model* – key-value model with schema
    5. *Object model* – set of OOP-style objects
13. **Give few examples of NoSQL databases and their pros and cons.**
    1. The pros and cons form most of the NoSQL DBs are the following:
       1. *Pros*:
          1. It's Open Source.
          2. Elastic Scaling.
          3. It’s in the cloud!
       2. *Cons*:
          1. It's Open Source.
          2. Not mature enough for enterprise.
          3. A bit new witch leads to lack of expertise and resources.
          4. Compatibility Issues.
    2. And some examples:
       1. Redis
       2. MongoDB
       3. CouchDB
       4. Cassandra