

# Database Systems – Overview

1. **What database models do you know?**
  - a. Hierarchical (tree)
  - b. Network / graph
  - c. Relational (table)
  - d. Object-oriented
2. **Which are the main functions performed by a Relational Database Management System (RDBMS)?**
  - a. Creating / altering / deleting tables and relationships between them (database schema)
  - b. Adding, changing, deleting, searching and retrieving of data stored in the tables
  - c. Support for the SQL language
  - d. Transaction management (optional)
3. **Define what is "table" in database terms.**
  - a. 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.**
  - a. 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.**
  - a. *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.
  - b. *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.
  - c. *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?**

- a. 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?**
  - a. Integrity constraints ensure data integrity in the database tables.
- 8. **Point out the pros and cons of using indexes in a database.**
  - a. *Pro* – quick search operations.
  - b. *Con* – slow add and remove operations.
- 9. **What's the main purpose of the SQL language?**
  - a. 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.**
  - a. 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?**
  - a. A NoSQL database, uses document-based model (non-relational) and is schema-free document storage.
- 12. **Explain the classical non-relational data models.**
  - a. *Document model* – set of documents, e.g. JSON strings
  - b. *Key-value model* – set of key-value pairs
  - c. *Hierarchical key-value* – hierarchy of key-value pairs
  - d. *Wide-column model* – key-value model with schema
  - e. *Object model* – set of OOP-style objects
- 13. **Give few examples of NoSQL databases and their pros and cons.**
  - a. The pros and cons form most of the NoSQL DBs are the following:
    - i. *Pros*:
      - 1. It's Open Source.
      - 2. Elastic Scaling.
      - 3. It's in the cloud!
    - ii. *Cons*:
      - 1. It's Open Source.

2. Not mature enough for enterprise.
3. A bit new with leads to lack of expertise and resources.
4. Compatibility Issues.

b. And some examples:

- i. Redis
- ii. MongoDB
- iii. CouchDB
- iv. Cassandra