Important Questions from the Lectures of Databases

Lecture 1. Introduction

What is a database? (definition)
  What are positive facts? Give an example.
  What is universe of discourse? Give an example.

What is a database system? (definition)

What is a database management system? (definition)
  List some components of a DBMS.
  What are the main functionalities?
  What are the secondary functionalities?

Which 4 types of users do we distinguish?
  What is the DA (Data Administrator)?
  What is the DBA (Database Administrator)?

Simple users have limited complexity, advanced users have full complexity. How come? What does it mean?

Give 5 benefits of using a database over flat files.

Explain the client-server architecture and give its benefits.
Lecture 2. Relational Databases

What are the benefits of having an underlying mathematical model (relational model)?

Explain the core concepts of the relational model and additional constraints.

What does atomic mean?

Explain cartesian product, selection, projection and join.

What is a candidate key?
What is a primary key? Why do we need it?
What is a foreign key? Why do we need it?
What are null values? When are they used? How do they affect the logic?

Why do we normalize a database (= what are possible problems with tables)?

What is a functional dependency? Give an example.

What is 1st normal form?
Give an example of a relation that is not in 1st normal form.
How do you bring the relation to 1NF?

What is 2nd normal form?
Give an example (different from the example on the lecture slides) of a relation that is not in 2nd normal form.
How do you bring the relation to 2NF?

What is 3rd normal form? Give an example (different from the example on the lecture slides) of a relation that is not in 3rd normal form.
How do you bring the relation to 3NF?

What is a multivalued dependency?
What is 4th normal form?

Normalization increases the number of tables. How do you combine them back into 1 table? What is needed for this (which keys)?

What may be the reason to denormalize? Which problems can occur, and how do you avoid them in a denormalized database?
Lecture 3-4. Entity Relationship Modelling

Name 3 aspects of integrity.

Explain “entity integrity” (objective and mechanism).
Explain “referential integrity” (objective and mechanism).
Explain “additional constraints”.

What is an entity in the context of ER modelling?
What is an entity class in the context of ER modelling?
What is the difference between top down and bottom up ER design?

Explain multiplicities of a relation; illustrate using crow's foot notation.
What is a one-many relation?
How does a one-many relation translate to tables?
What is a many-many relation?
How does a many-many relation translate to tables?
Can a foreign key in Table A be part of the primary key in Table A? Can null values be allowed for a foreign key?

Lecture 5-6. SQL

What is SQL?
What is DDL and what is part of DDL? Give examples.
What is DDL? Give examples.
Lecture 7-8. Transactions

What is the concept of a transaction?
Explain the ACID acronym.
What is atomicity (in the context of transactions)?
What is consistency (in the context of transactions)?
What is isolation (in the context of transactions)?
What is durability (in the context of transactions)?
What is a commit of a transaction? Who can decide to commit?
What is a rollback of a transaction? Who can decide to rollback?
How is a transaction specified?
What part of SQL is affected by a transaction?

Give 4 transaction anomalies.
What are dirty reads?
What are lost updates?
What are phantom records?
What are non-repeatable reads?

What are transaction isolation levels?
Who sets them?
What do they affect?
Explain the locking mechanism for transactions.
What are deadlocks?
How can they be avoided?
Discuss isolation level vs. concurrency.
Explain multi-versioning for transactions.
Lecture 9 Indexes

What is an index?
   On what is it defined?
What is the difference between a clustered index and a non-clustered index?

Which 3 data structures are commonly used?

What are the benefits and downsides of an index?
What are the benefits of defining a “unique index”?

When would you define an index?
When would you not define an index?

Lecture 10 DBMS Programming

What are stored procedures?
Where are they executed?
What are the benefits of stored procedures?
What is the point of system stored procedures?

What are triggers?
Which events can be used to fire a trigger?
Give an example where you could use a trigger.

Lecture 11 System architecture patterns

What are distributed databases?
When and why do you use them?

What is a distributed transaction?
Compare distributed transactions with replication.

Which 3 types of replication were mentioned?
   Explain transactional replication.
   Explain snapshot replication.
   Explain merge replication.

What is the difference between hot and cold failover clusters?

What is the benefit of the multi-tier model?

Lecture 12 JDBC

What is the difference between “statement” and “prepared statement”?
When do you use a prepared statement?

What are the downsides to establishing a connection in JDBC directly?
What is connection pooling?