**Problems from Elmasri Chapter 9**

**3) Try to map the relational schema in Figure 6.14 into an ER schema. This is part of a process known as reverse engineering, in which a conceptual schema is created for nan existing implemented database. State any assumptions you make.**

**7) Is it possible to successfully map a binary M:N relationship type without requiring a new relation? Why or why not?**

No, you cannot represent an M:N relationship type by a single foreign key attribute. You have to create a new relation S to represent R. This is because of the M:N cardinality ratio. We have to create a separate relationship relation S. Each relationship instance has an existence dependency on each of the entities it relates.

**Problems from Elmasri Chapter 10**

**3) Why is it important to design the schemas and applications in parallel?**

You have to think about the possible system modifications when designing the database. If the database schema isn't defined well, it cannot be modified easily once the database is implemented. There are multiple phases of the design and implementation of large databases. The design process has two parallel activities. The first is the design of the data content. structure, and constraints of the database. The second is the design of database applications. The two activities often depend or influence each other. Designing the schemas and applications in parallel accomplish the goals of database design.

**4) Why is it important to use an implementation-independent data model during conceptual schema design? What models are used in current design tool? Why?**

You want to make a conceptual schema for a database that is independent of a specific DBMS, so it is important to use implementation independent models during conceptual schema design. Models that are typically used are the ER or EER model. We use an independent model for the conceptual design to keep it free from implementation considerations.

**6) Consider an actual application of a database system of interest. Define the requirements of the different levels of users in terms of data needed, types of queries, and transactions to be processed.**

An application of a database could be iTunes for example. iTunes could require the user to make an account which would include gathering data from the user such as their name, email, a password, etc. The types of queries could be searching up artists, songs, playlists, etc. Examples of a transaction could include purchasing songs, albums, etc.

**Problems from Elmasri Chapter 15**

**5)** **What is a functional dependency? What are the possible sources of the information that defines the functional dependencies that hold among the attributes of a relation schema?**

A functional dependency is a constraint between two sets of attributes from the database. A functional dependency is a property of the relation schema R. X functionally determines Y in a relation R. The functional dependency specifies a constraint on the possible tuples that can form a relation state r of R.

**9)** **What undesirable dependencies are avoided when a relation is in 2NF?**

When a relation is in second normal form, there is no repeating data in the same rows of a table because the functional dependencies between columns are removed. Relations where primary key contains multiple attributes, no non-key attribute should be functionally dependent on a part of a primary key.

**10) What undesirable dependencies are avoided when a relation is in third normal form?**

When a relation is in third normal form there isn't any data in a table that is dependent on the table's primary key. Functional dependencies that should be avoided are when a nonprime attribute determines another nonprime attribute, and when a proper subset of a key of R functionally determines a nonprime attribute.

**13)** **What is a multivalued dependency? When does it arise?**

A multivalued dependency is something that happens from first normal form. With a multivalued dependency an attribute in the table cannot have a set of values. They arises when the presence of one or more rows in a table implies the presence of one or more other rows in the same table.

**Problems from Elmasri Chapter 21**

**1) What is meant by the concurrent execution of database transactions in a multiuser system? Discuss why concurrency control is needed, and give informal examples.**

In multiuser systems, many users are able to use the system at the same time. Concurrency control is needed when there are multiple database transactions with access to the same data is executed simultaneously. An example of this would be if two users are trying to reserve a last seat for a movie. Concurrency control would prevent the last ticket from being sold to both of the people looking to purchase it. It would provide a ticket to the person that processed it first.

**6.) Discuss the atomicity, durability, isolation, and consistency preservations properties of a database transaction.**

These are the properties that transactions should possess. Atomicity means that something is either performed entirely or not at all. Consistency refers to when a transaction is completely executed from beginning to end without interference from other transactions. Isolation is when the execution of a transaction should not be interfered with by any other transactions that are being executed concurrently. Durability means that the changes that are made in a database by a transaction must still be in the database, and cannot be lost.

**Problems from Van Bruggen Chapter 4**

1. **The four fundamental data constructs of Neo4j are:**

Nodes, relationships, properties, and labels

Nodes are used to store entity information. Relationships are used to connect nodes to one another and provides a structuring to your entities. Relationships always have a type, a start and end node, and a direction. Properties are name and value pairs. Labels are ways to quickly and efficiently create subgraphs. Labels are used for indexing.

**3)** **If you have a few entities in your dataset that have lots of relationships to other entities, then you can't use a graph database because of the dense node problem.**

True but there is no alternative, so you will have to live with it.