1. Describe with your own words what a database is!

**A database is a collection of information that is organized so that it can be easily accessed, managed and modified.**

2. Write three points, which you request from your database and explain them!

**a. Data persistence: the data should be independent of runtime of programs and remain unchanged even after turning off the flow of current.**

**b. Availability of different search possibilities (terms): The database should be in such a way structured, that I can talk to it in a “result oriented” way.**

**c. Availability of selection/search functions –which allow getting the data in structured views, by describing the wanted view - and administration functions – which allow the insertion, deletion and modification of data, but also setting rules for interacting with the data.**

**d. Data without redundancies and inconsistency: see below.**

**e. Designed for multi-user operation: The database should allow concurrent manipulation of data (usage of the database by a user isn’t blocking usage by other persons).**

3. What are redundancies? Write about their consequences!

**Redundancy means that individual data was entered in the database multiple times (same content, but in a slightly different form). Consequences: Datasets are difficult to find and change, or are inconsistent (contradicting datasets).**

4. Discuss at least two different database models and describe two advantages and disadvantages! Do not forget that an advantage of one model can be a disadvantage of the other.

**a. Hierarchical database:**

**Advantages - Data at the top of the hierarchy is very fast to access. Data can be easily added or deleted. Somewhat easy to read (if the database is small enough) because it relates to natural hierarchies (social, work, etc. hierarchies).**

**Disadvantages – More sophisticated relationships require that the data is stored in different entities. Searching for data can be really slow, if the hierarchy is too deep. Many to many relationships are not supported (only one to many).**

**b. Relational database:**

**Advantages – Can manage endless sets of data in tables without having to reenter the data a second time. Separate records for each type of data can be stored. The exact data that is needed can be retrieved by devising a query or formula describing the required information. Because relationships between tables can be formed, querying information from many tables is possible.**

**Disadvantages – The queries can become really complicated. This type of database requires good design and management skills to keep it optimal and free of redundancies or inconsistencies.**

5. What is the difference between a table and a relation?

**Relations are functions or equations, meanwhile tables are a visualization of those functions or relations and only present the user with the values which belong to said relation.**

6. A library wants to use a database to manage all their books. The following table has to be implemented:

|  |  |  |  |
| --- | --- | --- | --- |
| ID | AUTOR | TITLE | PUBLISHER |
| 1 | Matthias Schubert | Datenbanken | Teubner |
| 2 | Johnson | Entwurfsmuster | Addison-Wesely |
| 3 | Goll | Java als erste Programmiersprache | Teubner |
| 4 | Beutelspacher | Kryptologie | Vieweg |
| 5 | Beutelspacher | Diskrete Mathematik | Vieweg |
| 6 | Helms | Java als erste Programmiersprache | Teubner |
| 7 | Helms | Entwurfsmuster | Addison-Wesely |

In this table you will find some draft mistakes, which can cause redundancies. Write about the mistakes and create a new draft (by using several tables).

**AUTORS** **PUBLISHERS**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| ID\_AUTHOR | NAME\_AUTHOR |  | ID\_PUBLISHER | NAME\_PUBLISHER |
| 1 | Matthias Schubert |  | **1** | Teubner |
| 2 | Johnson |  | **2** | Addison-Wesely |
| 3 | Goll |  | **3** | Vieweg |
| 4 | Beutelspacher |  |  |  |
| 5 | Helms |  |  |  |

**BOOKS**

|  |  |  |  |
| --- | --- | --- | --- |
| ID\_BOOK | NAME\_BOOK | ID\_AUTHOR | ID\_PUBLISHER |
| 1 | Datenbanken | 1 | 1 |
| 2 | Entwurfsmuster | 2 | 2 |
| 3 | Java als erste Programmiersprache | 3 | 1 |
| 4 | Kryptologie | 4 | 3 |
| 5 | Diskrete Mathematik | 4 | 3 |
| 6 | Java als erste Programmiersprache | 5 | 1 |
| 7 | Entwurfsmuster | 5 | 2 |

7. Mark in your new tables (Exercise 6) two …

a. ... attributes **RED IN TABLE (UNIQUE COLUMN IN TABLE)**

b. ... attribute values **BLUE IN TABLE (INDIVIDUAL VALUE IN COLUMN)**