PART 1, 2 & 3: Chapter 1 (Goals of Effective Database Design)

1. Compare this book to a database (assuming you don't just use it as a notebook, scribbling in the margins). What features does it provide? What features are missing?

   A book like this allows an individual to create, read and delete, however it does not allow for any updates. An example of this is when you write on the book you are creating new data, by reading you fulfil the read function and cancelling a sentence by drawing a line through it is similar to the delete function. Since this book is already printed it cannot be updated and when a new one is printed or version 8is released all updates made will be erased.

2. Describe two features that this book provides to help you look for particular pieces of data in different ways.

   There are two features in this book that provide help when looking for specific pieces of data. These features are the: Index and Summaries. The index is situated on the last six pages, making it easier to find chapters and particular headings in the book. While Summaries, situated on the last page of every chapter (before exercise) can help you find specific data in the chapter.

3. What does CRUD stand for? What do the terms mean?

   CRUD stands for four crucial database operations that should be provide: Create, Read (Retrieval), Update and Delete. This means that when you design a database, you will either create a new entry, read an entry, update it or delete it, or a combination of multiple, all of which must validate the new state entries correctly so that the database is accurate to the required outcomes

4. How does a chalkboard implement the CRUD methods? How does a chalkboard's database features compare to those of this book?

   On a chalkboard you can create by writing, read by seeing the words that a person has written, update by using a duster and then rewrite using the chalk. To delete the text you need to erase using a duster.

5. Consider a recipe file that uses a single index card for each recipe with the cards stored alphabetically. How does the database's features compare to those of a book?

   The index card database is similar to that of the book. Since both of the database types are paper copies they have similar functions. However the index file has a more complicated system and requires a lot more spaces than this book.

6. What does ACID stand for? What do the terms mean?

   ACID is an acronym describing four features: Atomicity, Consistency, Isolation and Durability. Atomicity is when the transitions are atomic, this means either all the operations occur together or not at all. Consistency means that the transactions within the operation remain the same, before and after the transaction. Isolation is where the transaction is private to only the person in charge or the transaction and no one else. Finally durability mean that the transaction is persistent and will not disappear like volatile data.

7. Suppose Alice, Bob and Cindy all have account balances of $100 and the database does not allow an account's balance to ever drop below zero. Now consider three transactions: '
1) Alice transfers $125 to Bob, 2) Bob transfers $150 to Cindy, and 3) Cindy transfers $25 to Alice and $50 to Bob. In what order(s) can the transactions be executed successfully?

Task 3) will happen first (Cindy transfers $25 to Alice and $50 Bob), then task 1) (Alice transfers $125 to Bob) and finally task 2) will take place (Bob transfers $150 to Cindy). So Alice will end up with $0, Bob with $25 and Cindy with $175.

8. Explain how a central database can protect you confidential data.

A central database saves all your data through network attached storage, which makes it less likely for someone to steal. Computers, unlike the cloud, computers can be stolen and information that is confidential can be taken from them. Low level crimes like this cannot be done with the cloud.

PART 1 & 3: Chapter 2 (Database Types)

For the following scenarios, list the type(s) of database that might make good choices for storing the data.

1. A dog breeding database that records the ancestors of a single dog for five generations.
   XML File Database

2. A similar dog breeding database that records the ancestors and descendants of a single dog for five generations each way.
   Hierarchical Database

3. Application setting that record which windows a user had opened and where they were positioned the last time the application was used.
   Window System Registry

4. Total sales figures by month, arranged to make it easy to see trends graphically.
   Spreadsheet Database

5. The same as Exercise 4. But the users want to be able to draw similar data for several product lines on the same graph.
   Spreadsheet Database

PART 4 & 5: Chapter 1 (Introduction to SQL)

1. As it happens, the film club holds meetings regularly in several different loctions, which means a lot of redundancy in the Attendance table. What changes could you make to the database table structure?

   Splitting member and meeting details into multiple tables saves a lot of data redundancies. The member details are stored once only, with the only redundant data being the member's name, which links the multiple tables together.

   To deal with redundancies use unique ID's in the database, so you reduce the number of tuples, hence reducing the database table structure and reducing the compute time.

   LOCATION TABLE

Field Name	Data Type	Description
locationId	integer	Main Key
Location	varchar(150)	

   ATTENDANCE TABLE

Field Name	Data Type	Description
meetingDate	date or datetime	Data type depend of server type
locationId	integer	Secondary Key
memberAttendance	varchar(3)	Yes or No
memberId	integer	Secondary key links to memberId

2. Write the necessary SQL to complete the changes required by Exercise 1 and at the same time split the location's address details into street, city and state.

   Alter Table Attendance
     DROP COLUMN Location;

   Alter Table Attendance
     ADD locationId integer;

PART 6 & 7: Chapter 1 (Introduction to Databases)

1.1. List four different database systems other than those listed in Section 1.1.
1) Booking an appointment at the Dentist
2) Recording a movie on the cable box
3) Enrolling for classes on the University website
4) Tapping a card onto an NFC sensor pad.

1.2. Discuss each of the following terms:

a) Data

The most important component of the DBMS environment, certainly from the end-users' point of view.

b) Database

A shared collection of logically related data, and a description of this data, designed to meet the information needs of an organization.

c) Database Management System

A software system that enables users to define, create, maintain and control access to the database.

d) Database Application Program

A computer program that interacts with the database by issuing an appropriate request (typically an SQL statement) to the DBMS.

e) Data Independence

A DBMS must include facilities to support the independence of programs from the actual structure of the database.

f) Security

Database Management Systems must furnish a mechanism to ensure that only authorized users can access the database

g) Integrity

A DBMS must furnish a means to ensure that both the data in the database and changes to the data follow a certain rules.

h) Views

Views provide a level of security, mechanism to customize the appearance of the database and can present a consistent, unchanging picture of the structure of the database

1.3. Describe the approach taken to handling of data in the early file-based system. Discuss the disadvantages of this approach.

Early file-based systems were better for the security they provided as it was not hackable and if a file cabinet had a lock, they were not accessible. However the disadvantage is that is the number of inputs grew to a large amount the file-based system would fall apart and break down, needing constant cross-referencing. Another limitation of the file-based system were the difficulty for duplication.

1.4. Describe the main characteristics of the database approach and contrast it with the file-based approach.

The database approach enables for large data to be stored in a small spaces, this database can also be accessed by any authorised personnel from any location, with the use of a computer. While the file-based approach requires plenty of space, is not able to be accessed from various locations and has limitations of duplication and risk of falling apart.

1.5. Describe the five components of the DBMS environment and discuss how they relate to each other.
1) Procedures
2) Hardware
3) Software
4) People (Users & Roles)
5) Data

1.6. Discuss the roles of the following personnel in the database environment:

a) Data Administrator

The DA is responsible for the management of the data resource including database planning, development and maintenance of standards, policies and procedures and conceptual/logical database design.

b) Database Administrator

The DBA is responsible for physical realization of the database, including physical database design and implementation, security and integrity control, maintenance of the operational system, and ensuring satisfactory performance of the application for users

c) Logical Database Designer

Logical database designers involve all prospective database users in the development of the data model. And this involvement should begin as early in the process as possible.

d) Physical Database Designer

The Physical database designer decides how the logical database design is to be physically realized. This involves: Mapping logical database design, selecting specific storage structures and designing any security measures required on the data

e) Application Developer

The Application developer works from a specification produced by system analysts. Each program contains statements that request the DBMS to perform some operation of the database.

f) End-users

The end-user are the 'clients' for the database, which has been designed and implemented, and is being maintained to serve their information needs. End-users can be classified according to the way they use the system:

1.7. Discuss the advantages and disadvantages of DBMSs.

Advantages	Disadvantages
Control of data redundancy	Complexity
Data consistency	Size
Amount of Data	Cost of DBMS
Sharing the Data	Additional hardware costs
Improved Security	Cost of conversion
Enforcement of standards	Performance
Increased Productivity	Higher impact of a failure

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