TITLE: Experiment Write-up (EW)

Subject: Database Management System Laboratory

EXPERIMENT NO:-- 01

TITLE: Draw E-R diagram for a given scenario (eg. bank, college etc.)

LEARNING OBJECTIVES:

1. To study the fundamental concepts of database management.
2. To learn the basic issues of transaction processing and concurrency control.
3. To learn a powerful, flexible and scalable general-purpose distributed database.

THEORY:

Database:
If the data is stored in a well-organized manner, then it allows user to access and search data very easily. The **Database** is used to store information in a well-organized manner (i.e. Tables) useful to an organization. A collection of records or files of information grouped together is called as **Database**. **Record** is a collection of related data. (ex. A person's name, telephone number, and address).

DBMS:
Data storage is the most important thing while programming. This facility ensures access to data at any moment when user runs the program. (Eg. In C programming the data storage facility is provided by an operating system. There is no special software to store the data.) When amount of data to be stored becomes large, it becomes difficult to manipulate the data operations like storing and searching. The **D**ata**B**ase **M**anagement **S**ystem is the set of the interrelated data and the set of programs to operate on it.

The collection of interrelated data is known as **Database**.**The basic goal of Database Management System is to provide the way to store and retrieve the data in efficient and convenient manner**. When the data is in large amount is to be manipulated, we need a DBMS to manage it

Functions of DBMS :

1. Data Storage Management: It provides a mechanism for management of permanent storage of the data. The internal schema defines how the data should be stored by the storage

management mechanism and the storage manager interfaces with the operating system to access the physical storage.

2. Data Manipulation Management: A DBMS facilitates users with the ability to retrieve, update and delete existing data in the database.

3. Data Definition Services: The DBMS accepts the data definitions such as external schema, the conceptual schema, the internal schema, and all the associated mappings in source form.

4. Data Dictionary/System Catalog Management: The DBMS provides a data dictionary or system catalog function in which descriptions of data items are stored and which is accessible to users.

5.Authorization / Security Management: The DBMS protects the database against unauthorized access, either international or accidental. It furnishes mechanism to ensure that only authorized users an access to the database.

6. Backup and Recovery Management: The DBMS provides mechanisms for backing up data periodically and recovering from different types of failures. This prevents the loss of data.

7. Concurrency Control Service: Since DBMSs support sharing of data among multiple users, they must provide a mechanism for managing concurrent access to the database. DBMSs ensure that the database kept in consistent state and that integrity of the data is preserved.

8. Transaction Management: A transaction is a series of database operations, carried out by a single user or application program, which accesses or changes the contents of the database. Therefore, a DBMS must provide a mechanism to ensure either that all the updates corresponding to a given transactions are made or that none of them is made.

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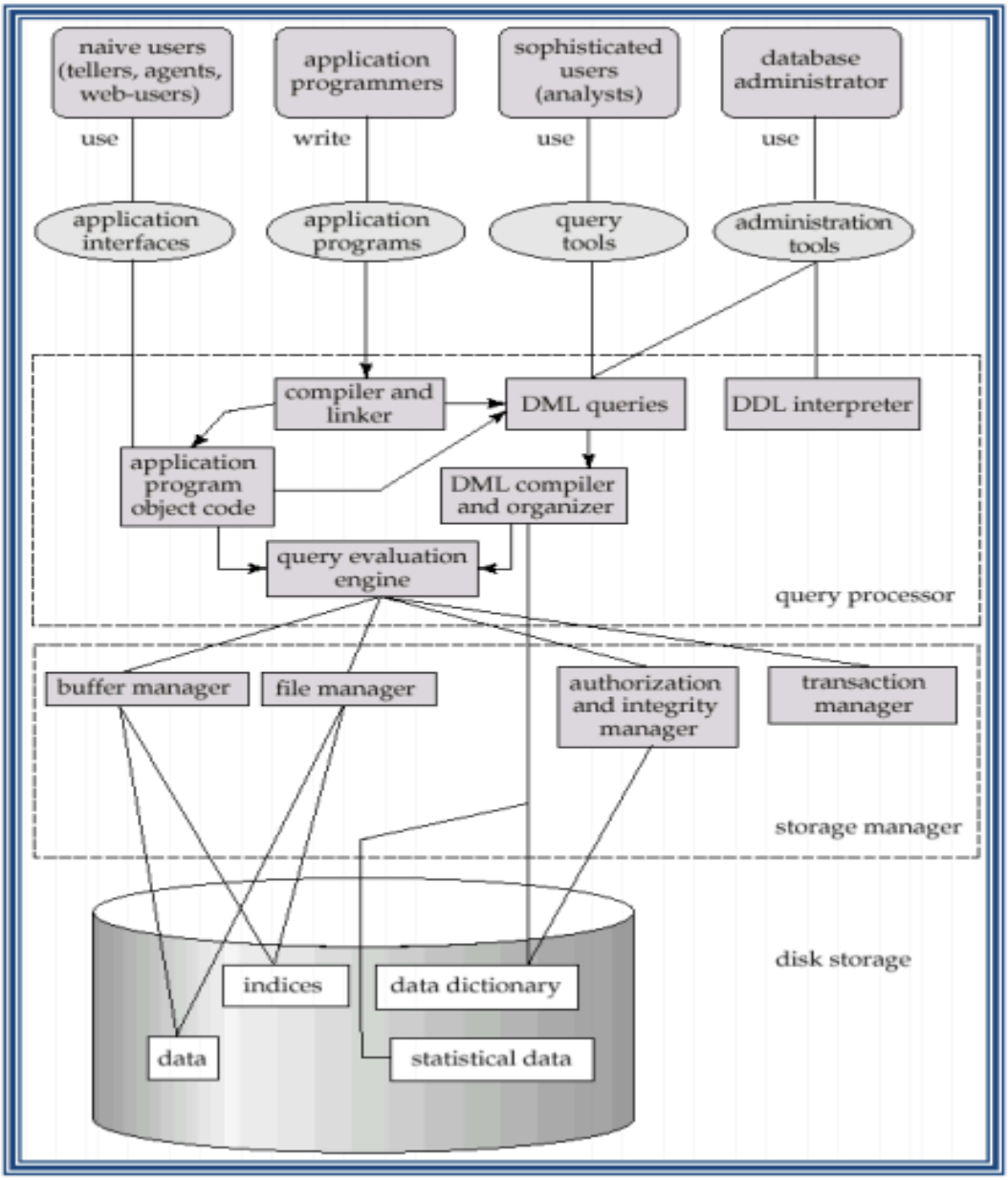

Components of DBMS and Overall Structure of DBMS :

Components of DBMS are broadly classified as follows :

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1) Storage Manager :

In overall structure of the DBMS, the storage manager can be referred as a program or module. The storage manager is very important as very large databases require the storage space in gigabytes or even in terabytes. Storage manager provides an interface between the lower level data stored in the database and application programs. It also acts as an interface between database and queries submitted by the system. The storage manager takes the responsibility to interact with the file manager. The storage manager compiles and translates the commands of DMLs into low level file system commands, then they are executed. Thus the storage manager is responsible for storing, retrieving and updating data in the database. The components of storage manager are :

a) Authorization and Integrity Manager : The major functions of this manager are to check the integrity constraints and check the authority of the user to access the data. Integrity constraints are the restrictions on the data given by the users. So the satisfaction level of the integrity constraints is checked. Another function is to check the authorities of the users to access, retrieve or update the data form or to the database.

b) Transaction Manager : A transaction is collection of operations that performs a single logical function in a database application. The transaction manager ensures that the database remains in a consistent (correct) state despite system failures and that concurrent execution proceed without conflicting.

c) File Manager : File manager manages the allocation of space on disk. It allocates required space to the files which are stored on the storage disk. It also takes care of the data structure which represents the information stored on the disk.

d) Buffer Manager : Buffer manager is the temporary memory which is used to transfer data or information from one device to other. Buffer manager manages the transfer of the data from the disk to the main memory. Some complicated situations occur if the database is very large and main memory is less. Such a type of critical situation is handled by the buffer manager.

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2) Data Structures :
The storage manager uses some data structures to represent as a part of physical system implementations. These data structures are :

a) Data Files : It stores the actual data itself.
b) Data Dictionary : This the data about the data i.e. metadata. This is about the structure of the database in the system.
c) Indices : Indices are used for the fast search of the data in the database. Using indexing it becomes easy to find out the expected data. If we index the file, the records gets arranged in the particular order.

d) Statistical Data : It stores statistical information about the data in the database. This information is used by query processor to select efficient ways to execute the query.

3) Query Processor :
The Query Processor includes :
i) DDL Interpreter
ii) DML Compiler
iii) Query Evaluation Engine
iv) DML Compiler and Organizer
v) Compiler and Linker
vi) Application Program Object Code

i) DDL Interpreter : The DDL Interpreter interprets or reads the DDL statements and records the definitions of the file and adds it in the data dictionary. A user of the DDL script would ask the DDL interpreter to load the script and provide the interpreter with a block of data (a file) from which user wishes to retrieve data.

ii) DML Compiler : DML compiler translates DML statements into the low level instructions. Low level instructions are understandable by query evaluation engine. DML compiler generates the evaluation plans which are chosen by query evaluation engine. A query evaluation is done using different alternatives. The compiler then does query optimization i.e. it chooses a proper plan which is appropriate.

iii) Query Evaluation Engine : The Query Evaluation Engine executes the low level instructions generated by the DML compiler.

iv) DML Compiler and Organizer : This compiles the DMLs into lower level instructions and arranges or organizes the output.

v) Compiler and Linker : Compiler compiles the instructions given by the user and the linker links them with the standard library functions or methods or statements provided by the query language. Compilation is the process of converting programs written in high level language to low level language.

vi) Application Program Object Code : Source code is the original program written. Application is viewed after execution of the source code. But when source code gets executed, first it gets converted into object code which is understandable by computer system.

E-R Model

The **Entity-Relationship(E-R) model** was originally proposed by Peter in 1976 for database design. E-R model is a conceptual data model that views the real world as **entities** and **relationships**. It is a **Top down approach** of database designing.

Relationship is a natural association that exists between one or more entities.

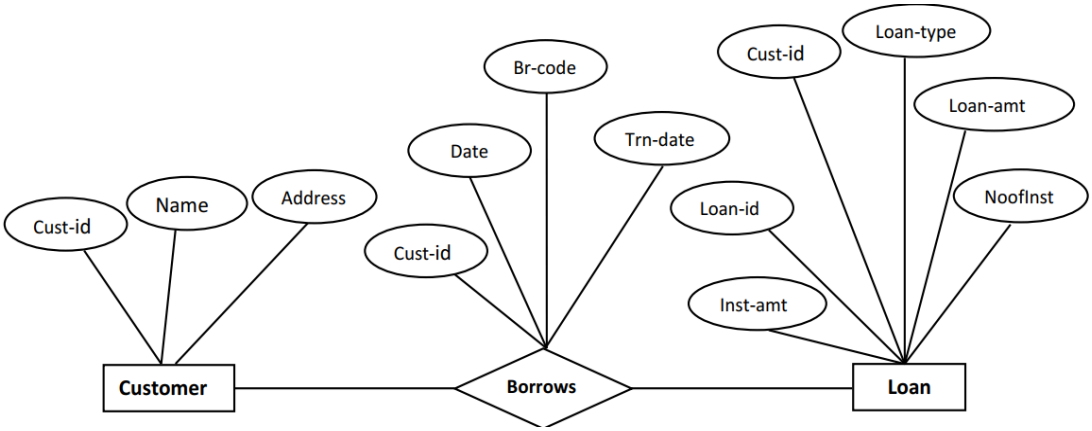
Features of E-R Model :

1) E-R diagram used for representing E-R model can be easily converted into Relations(tables) in Relational model.

2) The E-R model is used for the purpose of good database design by the database developer so

to use that data model in various DBMS.
3) It is helpful as a problem decomposition tool as it shows the entities and relationships between those entities.
4) It is inherently an iterative process.
5) It is very simple and easy to understand by various types of users and designers because specific standards are used for their presentation.

E-R Diagram for Bank & Customer:



E-R Diagram for Customer, Account, Branch

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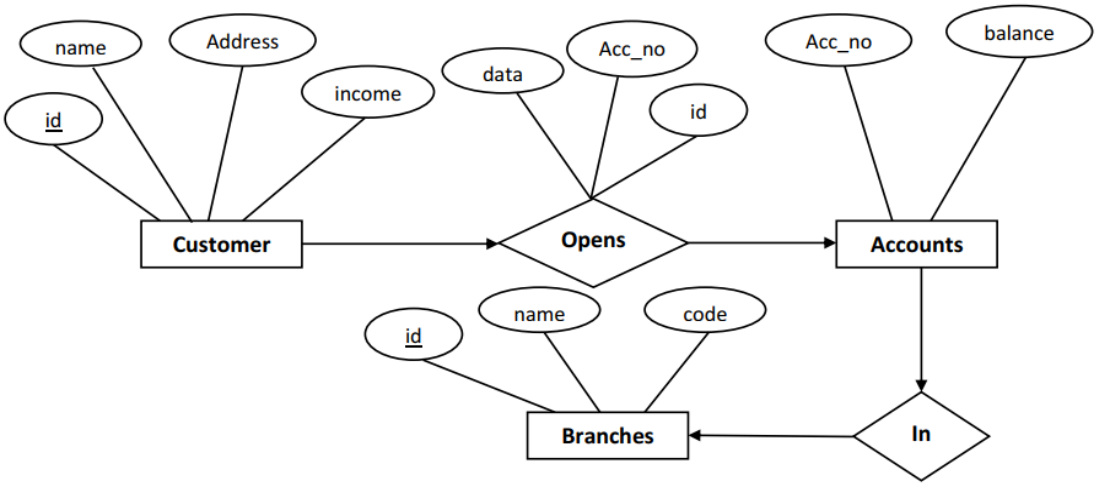
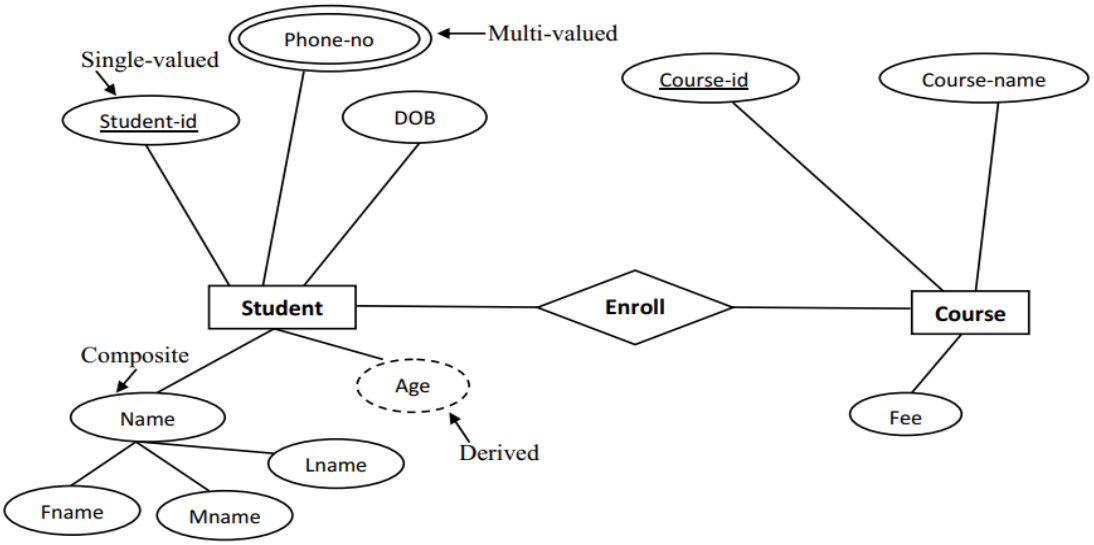


E-R Diagram for Student, Course, College:



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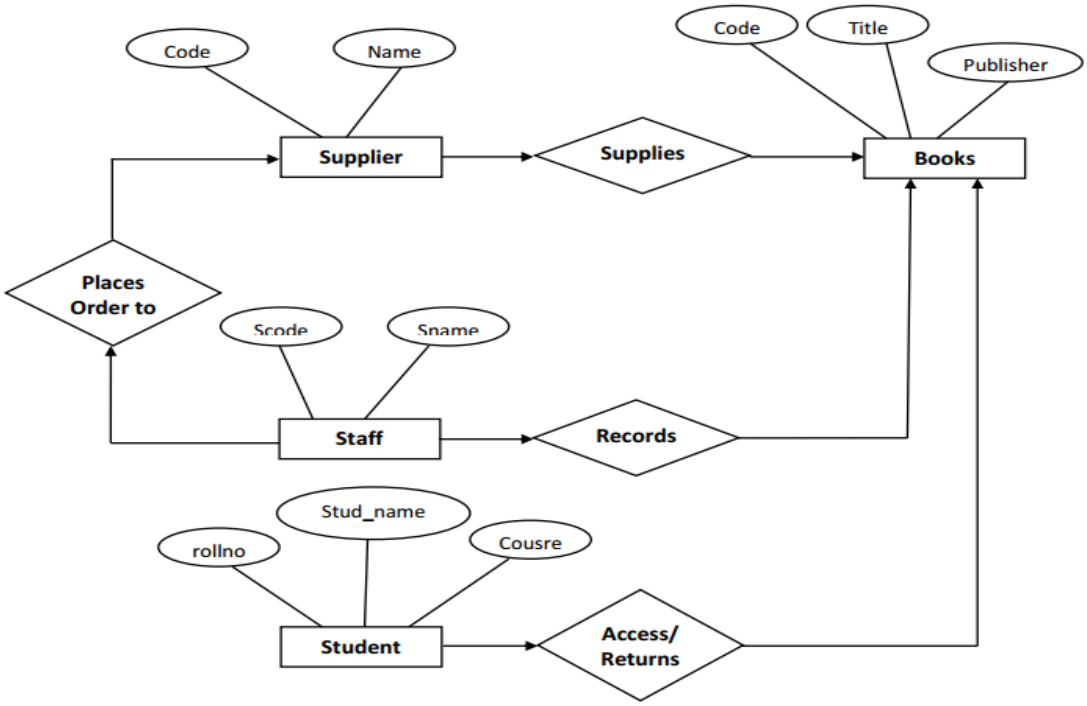

Note: Represent any one ER diagram into relation table for any given scenario.

References for Theory:

1. Silberschatz A., Korth H., Sudarshan S., "Database System Concepts", MGH
2. Connally T, Begg C., "Database Systems", Pearson Education
3. Raghurama Krishan, "Database Management Systems", McGrawHill
4. S.K.Singh, "Database Systems : Concepts, Design and Application", Pearson

CONCLUSION:_____

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