DATABASE MANAGEMENT SYSTEM

[Short Answer question]

* DATABASE *

A database is a collection of information organized in such a way that a computer program can quickly selected desired pieces of data.

or,

A database is a collection of related data organized in a way that datas can be easily accessed, managed and updated.

* Features of database *

• Data can be stored in well organized form.
• We can retrive data in no time.
• Some data can be used by different users.
• Data can be filtered.
• We can perform operations or data
• Highly sequred.

* What is DBMS? write the Functions of it.

A DBMS is a software that allows creation, definition and Manipulation of database. It is actually a tool used to perform any kind of operation on data in database. DBMS also provides Protection and security to database. It Maintains data consistency. in case of multiple user.

Some example : DBMS , My SQL , Sybase.

[Function of DBMS]

• Provides data independence
• concurrency control
• provides utility services
• Backup Services
• provides Security
• Integrity
• Allow multi-user data sharing.

* Write down the advantages and disadvantages of DBMS.
=>

Advantages of DBMS

① **Improved data sharing :** The data can be shared by authorized user of the organization. The DBA manages the data and gives right to user to access the data.

② **Improved data security :** Data security is the protection of the database from unauthorized users. only the authorized persons are allowed to access the database.

③ **Data integration :** In DBMS, database is database is stored in tables. A single database contains multiple tables and relationship can be created between tables.

④ **Improved decision making :** Better data management and improved data access make it possible to genrate better-quality information, on which better decisions are based.

⑤ **Reduction of Redundancies :** Centralized control of data by the DBA avoids unnecessary duplication of data and effectively reduces the total amount of data storage required.

⑥ **Providing Backup and Recovery :** A DBMS must provide Facilities For recovering from hardware or software. Failures. The backup and recovery subsystem of the DBMS is responsible for recovery.

Disadvantage of DBMS

① **Cost :** A significant disadvantage of the DBMS system is cost. DBMS requires high initial investment for hardware, software and trained staff. A processor with speed of data processing and memory of large size is required to run the DBMS software.

② **Complexity :** A DBMS fulfill lots of requirement and it solves many problems related to database. But all these functionality has made DBMS extremely complex software.

③ **Technical staff requirement:** Any organization have many employees working for it, is not easy for them to work on DBMS in their domain. The trained technical staff such as database administrator, a team of technical staff and application programmer etc are required to handel the DBMS. we have to pay handsome solarie to theyn which increass the system cost.

④ **Currency Maintenance:** As new threat daily, so DBMS requires to updates itself daily. DBMS should be updates according to the current scenario.

⑤ **Database Failure :** As we know that in DBMS, all the files are stored in single database so changes of database failure become more. If database is corrupted due to power failure or it is crrupted on the storage media or any accidental failure of component, then our valuable data may be lost or whole system stops.

3) what is data security? what are the preventive measures used for security of data?

=>

Data Security refers to protective digital privacy measures that are applied to prevent unauthorized acess to computer, databases and websites. Data Security also protects data from corruption. Data Security is also known as information Security (I.S) or Computer Security.

Following are the preventive measure used for security of data.

① Authentication : Database authentication is the types of database Security that verify the user's dogin credentials which stores in database. If user's Login credentials match in database then user can access the database. An unauthentic user has cannot access the data.

② Database Encryption : Encryption is one of the most effective types of database, security which protect your database from unauthorized access access during storing and transmission over the internet. There are different types of encryption algorithm such as AES, MD5 which are used to encrypt and decrypt the types of sensative data.

③ Backup Database: Backup is another types of database Security which used to restore data in case of data Loss, data corruption.

④ Physical Security : Physical database security is the protection of database server room in order to protect from unauthorized access. Database serve should be located in secured and climate-controlled environment in a building.

⑤ Access control

⑥ Use strong password

⑦ Database Auditing.

* Define table, field and Records*.

=> **(i) Table:** A database is composed of records and find that hold data. Tables are also called datasheet. Each table in a database holds data about a different, but related subject. A table stores all of the records for a particular category.

Ex

Roll No	Name	AGE	ADDRESS	FEE
1	Kiran	17	Kathmandu	3500
2	Suren	16	Birratnagar	5000
3	Sita	16	Bhaktapur	4,000

(2) Field:

A Field is one piece of data or information about a person or thing. A field is a column in a table that is designed to maintain specific information about every record in the table. The field in the student table consist of Roll number, Name, Age, ADDress and FEE.

③ Records

Each table contains a lot of records. Data is stored in records. A record is all of the data or information about one-person or one thing. A record is composed of fields and contains all the data about one particular person, company or item in a database.

[4] What is Key? Explain primary key, candidate, candidate key, and Alternate Key.

=> A key is an attribute or a set of attributes, which is used to uniquely identify a record of a table. It uniquely identifies records or a combination of records from a huge database tables.

Primary Key

Primary Key is an attribute, which uniquely identifies each record within a table. It can't accept null value, we can have only one primary key in a table. A primary key is the column that contain values that uniquely identify each row in a table. A primary key is a special relational database table coloumn designated to uniquely identify each table record.

Alternate Key

It is a column or group of columns in a table that uniquely identify every row in that table. All the remaining candidate key which are not selected as a primary key are called alternate key. A table can have multiple choices for a primary key but only one be set as the primary key. All the keys which are not primary key are called an alternate key.

Candidate

Candidate Key

Candidate Key is a minimal super key, which contains no extra attributes. It is also called subset or super key. It is a set of attributes that uniquely identify records in a table. Candidate key is a super key with no repeated attributes. The primary key should not be selected from the candidate keys.

3) What is SQL? Explain DDL, DML and DCL database clanguage.

=> Structured Query Language (SQL) is used to communicate with a database. It is the standard Language for relational database management system. SQL Statements are used to perform tasks such as update datad on database, or, retrieve data from a database. Some common relational database management System that use SQL are: oracle, Sybase, microsoft SQL Server, Acess, Ingres, etc.

ⓐ Data Definition Language (DDI): Database designers use data definition Language (DDI) to define the Structure of a database. Data Definition Language (DDI) refers to the set of SQL commands that can create and manipulate the structures of a database. DDI Statements are used to create, change and remove objects including indexes, triggers, tables, and views.

Common DDI Statement are:-
• CREATE (generates a new table)
• ALTER (alters table)
• DROP (removs a table from database.

ⓑ Data Manipulation Language (DMI): once a database designer completes defining the Structure of a database. the database is ready for entry and manipulation of data. DMI is Statement are used for managing data in database. It include commands, user can add new records to the database, nevigate through its existing records, view contents of various fields of a record, Nevigate Modify contents of one or more fields of a record. delete an existing record, and Sort its records in desired sequence with the help of commonds.

• INSERT :- Insert data into a table
• SELECT :- Retrive data from the a database
• UPDATE :- updates existing data within a table
• DELETE :- deletes all records from a table, the space for the records remain.

© Data control Language (DCL)

The Data control Language (DCL) component of the SQL Language is used to create privileges to allow users acesss to, and Manipulation of, the database. There are two main commands

- GRANT: to grant a privilege to user
- REVOKE: To remove a privilege from a use-

Difference between Centralized database system and distrioted database system.

Sr	Centralized Database System	Sr	Distributed Database System.
1	It Stores data in single location	1	It Stores data in several locatren.
2	It consists of only one Server	2	It Consists servrs in Servers
3	It is cheaper	3	It is expensive
4	There is less chance of data loss by hacking	4	There is more chance of Data Hacking and Data loss.
5	Its maintancence process is easy	5	It's maintenance process is difficult
6	It is Suitable for small organizathon	6	It is Suitable for Large organization
7	Data traffic rate is High	7	Data traffic rate is low

Responsibilities of DBA:

- DBA has responsibility to install, monitor and upgrade database server.
- DBA should has responsibility to maintain database security by creating backup for recovery.
- He/she has responsibility to conduct traing on the use of database.
- DBA defines user privilege, relationship and manages form reports in database.

Differentrate Between DBMS and RDBMS with each

RDBMS	DBMS
Data is stored in table format	Data is stored in file format.
Multiple data elements are accessible fegthor.	Individual access of data elements.
Data in the form of a table are clinked fegethor.	No connection between data.
Normalization is achievable	There is no normalization.
Supports distributed database	No support for distributed database
Data is stored in a large amount	Data is stored in a small quantity.

* Define Distributed Database System and write down its Advantages and disadvantages.

=> A distributed database is a collection of multiple interconnected database, which are spread physically across varous Location that communicate via a computer network.

ADVANTAGES

- Backup and recovery of data is easier.
- It can handle large volume of data and user all over the world.
- User can experience high speed bandwidth.

DISADVANTAGES.

- very expansive to operate and maintain.
- Data Security may real issue.
- Hard to detect because there are many nodes.

* Explain about Database Administrator (DBA)

=> DBA is the most responsible person in an organization with Sound knowledge of DBMS. DBA is the overall administrator of the program. DBA has the maximum amount of privileges for accessing database and defining the role of the employee which use the system. The main goal of DBA is to keep database server upto date secure and provide information to the user on demand

Define centralized database system. Write down its Advantages and disadvantages.

=> Centralized computing is similar to a client/server archite-cture where one or more ~~than~~ clients pcs or directly connected to a central Server.

ADVANTAGES

- It is easy to maintain and fast
- It is able to provide better security for information.
- Soitable for small organization.
- It is easier to data access.
- It makes it easy for information to be changed or update.

DISADVANTAGES

- If Centralized Server failure due to some reasons all the datobes will be a loss.

- If the network is slow, then the searching process takes much time.

- ~~is~~ when the many records same place will be accessed at the same time the collision will be accord in the result of collision may be precious data will be clost.

- All data is stored in one place when many user access data at the same time the collision will be accord in the result of collision may be precious data will be Lost.

Data Integrity:

Data integrity refers to the accuracy and consistency of data stored in a database or a data warehouse. data with "integrity" is said to have a complete structure. All the characterics defining the data must be correct. Therefore many are wondering how to achieve data integrity. Data integrity is usally imposed during the database design phase through the use of standard proceducers and rules. It is maintained through the use of various error checking methods and validation procedures. The physical integrity of data refers to the process of storing and collecting data in the most correct way, maintaining it accuracy and reliability. The logical integrity of data, on the otherhand checks whether data is correct and accurate in a specific context.

Following are the three integrity constraints.

Entity Integrity :
Entity Integrity concened with the concept of primary keys and makes sure that no data is redundant and no fields are null. The rule states that every table must have its own primary key and that each has to be unique and not null.

Referential Integrity :
It refers to all procedures and rules enforced to ensure that data is stored and used consistently. This is the concept of foreign keys. The rule of foreign keys states that the foreign key value can be in two states.

Domain Integrity:
Domain integrity is a series of rules and proceduce that ensure all the data items pertain to the correct domains. Ex: If a user types a birthdate in a street address field, the system will show error message that will prevent the user from filling that field with wrong information.

What is database Model? Explain any two types?

=> A set of rules and standards that define How the database organizes data is called database model. It also define how users vies the organization of data. It define the logical design of data. It shows the Logical Structure of database, including the relationships, data types, Structure of table and constraints that determine how data can be stored and accessed.

Following are the types of Database model,

(i) Hierachical Model : The Hierachical database model defines hierachically arranged data. A hierachical database consist of a collection of records which are connected to one another through links. a record is a collection of field, each of which contains only one another data value. A Linic is an assocration between precisely two records. Heirarchical database model is a structure of data organized in a tree Like model using parent/child Like relationship.

(ii) Network Model : A Network database is a type of databe model where multiple member records or file can be Linked to multiple owner files and vice versa. This model is an extension of the hierarchical model. It was the most popular model before the relational model. In network model a record can have more than one parent. It replaces the hierachical tree with a Graph. this model allows each child to have multiple parent.

(iii) Relational Database Model : A relational database (RDB) is a a collection set of multiple data sets organized by table, records and columns. RDB, establish a well defined relationship between database tables. Table communicate and share information which information, which faciliates data search ability, organization and reporting. It is the most widely used model. In this model, the data is maintained in the form of a two dimensional table.

What is Normalization? Explain 1NF, 2NF and 3NF with example.

=> Normalization is the process of efficiently organizing data into in a database into tables and columns. Normalization is a systematic approch of decomposing tables to eliminate data redundancy and undesirable charactoristic Like insertion, update and deletion anomalies. Normalization is a systematic appro the process of organizing the data in database. It divids larger tables to smaller tables and clink them using relatronships.

Let us consider an un-normalized data attributes.

Name	Roll	Class	SubJect	Marks	SubJect	Marks
Ram	1	11	Computer	95	Account	78
Sito	1	12	Computer	98	Account	80
Hari	2	11	Computer	80	Account	82
Shyam	2	12	Computer	92	Account	83

1NF (First Normal Form).

• Eliminates duplicate columns from the same table.
• Creates separate tables for each group of releatd data and identify each row with a unique column called primary tkey.

Name	Roll	Class	SubJect	Marks.
Ram	1	11	Computer	95
Ram	1	11	Account	78
Sita	1	12	Computer	98
Sita	1	12	Account	80
Hari	2	11	Computer	80
Hari	2	11	Account	82
SHayM	2	12	Computer	92
Shayam	2	12	Account	83

In above table, we can see that column of SubJect name and marks are repeated which are eliminted in 1NF.

2NF (Second Normal form)

- It futher address the consept of remaining duplicate data.
- It Should be in 1NF.
- It removes the data that applies to multiple row of a table and place themin separate table.

Name	Roll	Class
Ram	1	11
Sito	1	12
Hari	2	11
Shayam	2	12

Name	Subject	marks·
Ram	Computer	95
Ram	Account	78
Sita	Computer	98
sita	Account	86
Hari	Computer	80
Hari	Account	82
Shyam	Computer	92
Shyam	Account	83

Sub Id	Class
Computer	11
Account	11
Compder	12
Account	12

In above table name depedent upon roll no and class, Subject depends upon name class. Marks depend upon name and Subject

3NF

- It Should be in 2NF form.
- It removs the column that are not dependent on primary key using 3NF.

Subect ID	Sublet
CI	Compute
AI	Account

Class ID	Class
XI	11
XII	12

Std-ID	Sub ID	marks·
1	CI	95
1	AI	78
2	CI	98
2	AI	80
3	CI	80
3	AI	82
4	CI	92
4	AI	83

Std. ID	Name	Roll	Class ID·
1	Ram	1	XI
2	Sata	1	XII
3	Hari	2	XI
4	Shyam	2	XII

ADVANTAGES AND DISADVANTAGES OF HIERCHICAL DATABASE MODEL.

ADVANTAGES

- It is easier to view data because data are arranged in manner. This makes database more suitable for the purpose.
- Because of its inherent parent child structure, database integrity is highly promated in these system.
- The hierarchical database model is very efficient because the database contains a large number of I:N relationships.
- Speed of access is faster because of the predefined data paths.

DISADVANTAGES

- Difficult to implement because it does not support many-to many (N:N) relationship. which are more common in real life.
- Database Management problems : If you make any changes. in the database structure of a hierachical database, then you need to make the necessary changes in all the application programs that access the database. Thus maintaining the database and the application can become very difficult.
- Programming Complexity : This requires knowledge of complex pointer systems.
- It Requires procedural access language.

✶ ADVANTAGES AND DISADVANTAGES OF Network database model.

ADVANTAGES

- It accepts many to many Relationships so, it is more flexible
- It reduces data redundancy.
- This network mode is simple and easy to design.
- Searching is faster due to use of multi-directional pointer.

DISADVANTAGES

- Needs long program to handle the relationship.
- Lack of structural independece.
- Less Sequirity.

✶ ADVANTAGES AND DISADVANTAGES of Relatronal database model.

ADVANTAGES

- There is Less data redundancy.
- Breaking of complex database into simple is very much easier.
- Database processing is faster than other model.

DISADVANTAGES
- Establishing more relationalships complex.
- Requires powerfull computer and data storages devices.

$\downarrow$ Explain How normilization Solves the problems of insertion, updatation and deletion anomalies in database.

=> Normilization Solves the problem in database by follow ways.

- By Removing all repeated data.
- By removing undesirable insertion, update and delation dependencies.
- Reducing the need to restructure the entire database every time time new field are added teit.
- Making the relationship between tables more usefull and undevstandabl/.

① Creating a database.

Syntax : CREATE DATABASE database_name;

Example : CREATE DATABASE college;

② Removing database (Dropping the database):

Syntax : DROP DATABASE database_name;

Example : DROP DATABASE college;

③ Create a table:

Syntax : Create table table_name (
```
        Column1 datatype,
        Column2 datatype,
        Column3 datatype
        - - - - - - - -
        - - - - - - -
```

Example:
```
        create table Students
        (
        Roll int,
        name varchar(50),
        address varchar(100),
        grade varchar(20)
        )
```

④ Removing table (Dropping a table)

Syntax: DROP TABLE table_name;

Example: DROP TABLE Students;

⑤ Alter Statement.

ⓐ Alter table - ADD Column.

Syntax: ALTER TABLE table_name
```
        ADD Column_name datatype;
```

Example: ALTER TABLE Students
```
        ADD Age int;
```

ⓑ ALTER TABLE - DROP COLUMN
   Syntax : ALTER TABLE table—name
            DROP COLUMN column—name;

   Example: ALTER TABLE students
            DROP COLUMN address;

ⓒ ALTER TABLE — MODIFY COLUMN.
   Syntax : ALTER TABLE table—name
            MODIFY COLUMN column—name datatype;

   Example : ALTER TABLE students.
            : MODIFY COLUMN class varchar;

⑥ Insert statement.
   Syntax : INSERT INTO table—name(column1, column2, ...)
            VALUES (value1, value2);
   Example : INSERT INTO students (roll, name, address, DOB) values
            (1, 'Roshan', 'ktm', 2002);

⑦ Select statement
   Syntax : Select column—name (s)
            FROM table—name;
   Example : SELECT * FROM students;
            [It will display all records from a table students]
            SELECT address FROM students;
            [It will display all address in a table student]

   using where clause:
   Syntax : SELECT column1, column2 ----
            FROM table—name
            where condition;

EXAMPLE : Select name from students.
　　　　　WHERE address = 'Kathmandu';

　　　　　Select roll , name, address .
　　　　　FROM Students
　　　　　ORDER By roll ASC;

⑧ Update Statement:
　　Syntax : UPDATE table_name
　　　　　SET column 1 = value 1 , column 2 = value 2 - -
　　　　　WHERE condition;
　　Example : UPDATE Students
　　　　　SET address = 'Dharan'
　　　　　where roll = '1';

⑨ DELETE Statement:
　　Syntax : DELETE FROM table_game
　　　　　where condition;
　　Example; DELETE From Students.
　　　　　where address = 'Dharan';

(10) Wildcard in SQL : A wildcard is used to substitute one or more characters in a string. wildcard is used with dike operator It can be * , ?% , n ,# etc.

2) To create a table named employees with following fields and insert the following records.

EMP_ID	EMP_Name	EMP_Address	EMP_Post	EMP_Salary
101	Nagendra	Ktm	Manager	50000
102	Darshan	Dharan	System Admin	40000
103	Sunita	Polchar	System Amdin	40000
104	Deepak	Ktm	Offren	35000
105	Kamal	Butwal	Accountant	30000

(a) To display all the records on the screen.

=> SELECT Emp_ID, Emp_Name, Emp_Address, Emp_post, Emp_Salary
FROM Employes.;

(b) Display Emp_Rame and Emp_post whose Salary is greater than 35000.

=> SELECT Emp_Name, Emp_post
FROM Employes
WHERE emp_Salary o > 35000;

© Display all the record of employees whoes emp_post is System admin

=> SELECT EMP_ID, Emp_Name, Emp_Address, Emp_post,
Emp_Salary
FROM &Employe
WHERE Emp_Post = "System admin";

(d) Display all the records of employee whose Sator Emp_ID is3.

SELECT Emp_ID, Emp_name, Emp_Address, Emp_Post,
Emp_Salary
FROM Employes
WHERE EMP_ID = "3";

ⓒ Display all the records of employee whohe Emp_Address is Ktm.

=> SELECT Emp_ID, Emp_Name, Emp-Address, Emp-Post, Emp_Salary.
FROM Employees
WHERE Address = "Ktm");

ⓓ Delete the record of employee whose Emp_Address is Butwal.

=> DELETE FROM Employees
WHERE Emp_Address = "Butwal";

ⓖ Display Emp_name and Emp_Salary of employ1.

=> SELECT Emp_name, Emp_Salary
FROM Employes;

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