

Database Systems Assignment 1

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Answer 1-

- a) **Database** – A database is a collection of related data . These facts are also known as data. A database system manages this collection of data.
- b) **DBMS** – A database management system, or DBMS is a computerised system which enables the user to create and maintain a database.
- c) **Database systems** – The pair of databases and its DBMS software is called database system.

d) **Program data and program operation independence –**

The structure of data files is stored separately in DBMS catalog separate from the access programs. Thus, if we want to apply changes to the structure of the data files, we need not change the access processes too. This is called program – data independence.

An operation in an object-oriented database system is specified in two ways, the interface and the implementation. The interface of the operation contains the operation names and it's parameters. Whereas, the implementation is specified separately, and can be modified without changing the interface. This is called program – operation independence.

- e) **Transaction processing** – A transaction is an executing program or process that includes one or more database accesses, such as reading or updating the records. Transaction properties ensures the integrity of data in the application, it ensures any changes in the database is made simultaneously to the database.

Answer 2-

The advantages of DBMS approach are as follows –

• **Control Redundancy:**

In the database approach, the views of different users is integrated during the database designing. This provides the capability to control redundancy and removes inconsistencies in the database.

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- **Restrict Unauthorised access:**
When multiple users share a database, it is important that not everyone is able to easily make changes to it. DBMS implements security and authorisation subsystem so that select restrictions can be made on accounts of individuals.
 - **Providing persistent storage for program objects:**
Databases can be used to provide persistent storage for objects in programs and data structures in object-oriented database systems. Hence complex objects can be stored in object-oriented databases easily.
 - **Providing storing structures and search techniques:**
Since databases are usually stored in disks, DBMS provides a way for quick search in the disk for the desired record.
 - **Providing backup and recovery:**
A DBMS system provides facilities for recovery of data in case of lost data and disk failure.
 - **Provide multiple user interface:**
Because many types of users with varying levels of technical knowledge use a database, a DBMS provides a variety of user interfaces.
 - **Represent complex relationship among data:**
A database may include numerous varieties of data that are interrelated in many ways. A DBMS have the capability to represent a variety of complex relationships among the data, to define new relationships as they arise, and to retrieve and update related data easily and efficiently.

- **Enforce integrity constraints:**
Most database applications have certain integrity constraints that must hold for the data. A DBMS should provide capabilities for defining and enforcing these constraints. For example, the simplest type of integrity constraints involves specifying a data type for each data item.
- **Permit inferencing and actions using rules and triggers:**
Some database systems provide capabilities for defining deduction rules for inferencing new information from the stored database facts. Such systems are called deductive database systems.
- **Additional Implications of Using the Database Approach: –**
Potential for enforcing standards
 - Reduced application development time
 - Flexibility
 - Availability of up-to-date information

– Economies of scale

Answer 3

Data model is a collection of concepts that can be used to describe the structure of a database. Data model provides basic operations and for specifying retrievals and updates on the database, and some concepts to specify the dynamic aspect or behaviour of a database application. Some examples are –

- Multimedia database – includes media like images etc.
- Network model – establishes many to many relation between the records, and stores data in a graph like structure with multiple parent nodes.

- Entity based data model – data model built upon real world objects called entities.
Ex – database of employees in a company.
- Key based data model – associates a unique key to each of its records to enable faster access to the database.
- Document data model – Based on JSON, stores data as documents, which are complex objects.

Answer 4-

- **DDL** – Data definition language or DDL, is a common language used in DBMSs where no strict separation of levels is needed to be maintained. DBMS has a DDL compiler whose function is to process DDL in order to identify the schemas, and store the schema constructs.
- **SDL** – Storage definition language (SDL) is used to specify the conceptual schema only.
- **VDL** – View definition language, or VDL is used in a three-schema architecture. It is used to specify user views and their mappings to the conceptual schemas.
- **DML** – Data manipulation language (DML) is used when data needs to be manipulated after all schemas have been compiled and database has been populated with the data. These manipulations usually are retrieval, deletion, insertion and modification.

- **SQL** - SQL is a high-level language used in the current DBMSs that includes structures for conceptual schema definitions, view definitions, and data manipulation. This is called “Structured query language” (SQL).

Answer 5-

Some common utilities administered in the database as a DB administrator could be –

- **Loading** – Loading utility is used to load existing data files – such as text files or sequential files into the database.
- **Backup** – A backup copy of the database is necessary in case of disk failure. The backup utility dumps the entire database into some form of external mass storage to create a copy of the database.
- **Database storage reorganisation** – this utility can be used to create new access paths to improve performance by reorganising a set of database files into different file organization.
- **Performance Monitoring** – This is to monitor the database usage and provide its statistics to DBA for improving performance.
The difference between logical data and physical data independence is as follows –
Logical Data Independence - It is the capacity to change the conceptual schema without changing the external schema (application programs). For example, expanding the DB by adding a record type or data item, changing constraints, reducing DB by removing a record, etc. Only the view and mapping need to be changed in a DBMS that supports logical data independence.
Physical Data Independence - It is the capacity to change the internal schema without changing the conceptual schema. Hence, the external schema need not be changed