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Assignment - I [IMT2023111]

Q-1 (i) **Database**

⇒ A database is a collection of related data that can be recorded and have meaning.

(ii) **DBMS**

⇒ A DBMS is a specialized software system designed to define, construct, manipulate and share databases among users and applications

(iii) **Database system**

⇒ The database and DBMS software are together called a database system.

(iv) **Program - data and program operation independence**

⇒ The structure of data files is stored in the DBMS catalog seperately from the access programs. This is called program-data independence.

⇒ The implementation of the operation is specified seperated and can be changed without affecting the interface. This is called program - operation independence.

(v) **Transaction - processing**

» A transaction is an executing program that involves one or more database accesses, including reading and updating records. Since multiple users may try to attempt to access and modify data simultaneously, a DBMS incorporates concurrency control to ensure that these operations are managed in a controlled manner to have a correct result.
This is called transaction - processing.

0-2 **Advantages of DBMS approach**

1. Control redundancy
2. Restrict unauthorised access
3. Provide persistent storage to program objects
4. Provide backup and recovery
5. Provide multiple user interface
6. Represent complex relationship among data
7. Enforce Integrity constraints
8. Potential for enforcing standards
9. Reduced application development time
10. Flexibility
11. Economies of scale

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Q.3 **Data model**

⇒ It is a collection of concepts that define the structure of a database, including data types, relationships and constraints. It also provides a set of fundamental operations for retrieving and updating data. Additionally, it manages the dynamic aspects of the database application, allowing users to specify operations on DB objects.

Five examples :-

① Key-value DM where a unique key is associated with each record or object providing fast access to a value given its key.

② Document DM based on JSON (JavaScript Object Notation) that stores data as documents.

③ Column based DM - stores the columns clustered on disk pages for fast access

④ Network DM - represents the data as record types and also represents a limited type of 1:N relationship.

⑤ XML model is a standard for "exchanging data over web" using hierarchical "tree structure". It resembles the object model.

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Q-4 ① DDL (Data Definition Language)
- used by DBA and DB designers to define conceptual and internal schemas and mapping between the two.

② SDL (Storage Definition Language)
- is used for specifying the internal schemas only (only for those that have separate schemas).
In modern RDMS, no specific language performs the role of SDL.

③ VDL (Views Definition Language)
- is used to specify user views and their mapping to the conceptual schema.

④ DML (Data Manipulation Language)
- is used to manipulate DBMS with operations like retrieval, insertion, deletion and modification of data.

⑤ SQL (Structured Query Language)
- is a comprehensively integrated language which uses DDL, VDL and DML
- It allows constraint specification and schema evolution.

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Q-5 DB Utilities that I will implement:

① Loading: This process involves importing existing records, such as text files or sequential files, into the database. It may also require reformatting the data to comply with the database structure and constraints.

② Backup: This utility creates a backup copy of the database on tape or other storage media for recovery in case of disk failure. To optimize storage, only recorded changes can be saved instead of duplicating the entire database.

③ Storage Reorganization: This involves ~~generating log data to~~ creating new access paths for performance improvements.

④ Performance monitoring: This involves generation of log data which acts as statistics for an administrator by which they can decide reorganizing the DB to improve performance.

⑤ Other utilities like data compression, storing files, monitoring access by user, interfacing with network etc can also be implemented.

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* Logical data Independence	Physical data Independence
① Ability to modify the conceptual schema without affecting the external schema.	① Ability to modify the internal schema without affecting the conceptual schema.
② Includes adding / removing records, changing constraints, or expanding the DB.	② Involves creating additional access structures for improved performance
③ Requires changes in views and mappings between external and conceptual schemas.	③ Requires modifications in the mapping between the internal and conceptual schemas.