

Programme Name: \_\_\_\_\_\_\_\_\_\_**BCS**\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Course Code: \_\_ **CSC 1403**\_\_\_\_\_\_\_\_

Course Name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_**Database Concepts**\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

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1. **List and briefly explain each Eight (8) functions of Database Management System (DBMS).**

 =There are several functions that a DBMS performs to ensure data integrity and consistency of data in the database. The Eight functions in the DBMS are: data dictionary management, data storage management, data transformation and presentation, security management, multiuser access control, backup and recovery management, data integrity management, database access languages and application programming interfaces.

* **Data Dictionary Management**

   Data Dictionary is where the DBMS stores definitions of the data elements and their relationships (metadata).  The DBMS uses this function to look up the required data component structures and relationships. When programs access data in a database they are basically going through the DBMS. This function removes structural and data dependency and provides the user with data abstraction. In turn, this makes things a lot easier on the end user. The Data Dictionary is often hidden from the user and is used by Database Administrators and Programmers.

* **Data Storage Management**

      This particular function is used for the storage of data and any related data entry forms or screen definitions, report definitions, data validation rules, procedural code, and structures that can handle video and picture formats. Users do not need to know how data is stored or manipulated. Also involved with this structure is a term called performance tuning that relates to a database’s efficiency in relation to storage and access speed.

* **Data Transformation and Presentation**

               This function exists to transform any data entered into required data structures. By using the data transformation and presentation function the DBMS can determine the difference between logical and physical data formats.

* **Security Management**

                This is one of the most important functions in the DBMS. Security management sets rules that determine specific users that are allowed to access the database. Users are given a username and password or sometimes through biometric authentication (such as a fingerprint or retina scan) but these types of authentication tend to be more costly. This function also sets restraints on what specific data any user can see or manage.

* **Multiuser Access Control**

             Data integrity and data consistency are the basis of this function. Multiuser access control is a very useful tool in a DBMS, it enables multiple users to access the database simultaneously without affecting the integrity of the database.

* **Backup and Recovery Management**

    Backup and recovery is brought to mind whenever there is potential outside threats to a database. For example if there is a power outage, recovery management is how long it takes to recover the database after the outage. Backup management refers to the data safety and integrity; for example backing up all your mp3 files on a disk.

* **Data Integrity Management**

                The DBMS enforces these rules to reduce things such as data redundancy, which is when data is stored in more than one place unnecessarily, and maximizing data consistency, making sure database is returning correct/same answer each time for same question asked.

* **Database Access Languages and Application Programming Interfaces**

                A query language is a nonprocedural language. An example of this is SQL (structured query language). SQL is the most common query language supported by the majority of DBMS vendors. The use of this language makes it easy for user to specify what they want done without the headache of explaining how to specifically do it.

1. **List any Five (5) limitations of the File-Based Approach and Explain each one briefly**

Answer= Any five limitations of the File-Based Approach are given below:

* **Separation and isolation of data:**

Difficult to access data that is available from two files like Student that achieved good academic result and active in extra curriculum activities. Data isolation is a property that determines when and how changes made by one operation become visible to other concurrent users and systems. This issue occurs in a concurrency situation. This is a problem because It is difficult for new applications to retrieve the appropriate data, which might be stored in various files.

* **Duplication of data:**

Data duplication is a process of creation of an exact copy of data on a different medium. Most [data duplication software](https://www.handybackup.net/data-duplication.shtml) out there simply lets you select files and folders and copy them to a selected place. Additional storage space is needed and inconsistence of data. It cost time and money to enter data more than once. If duplicated data is updated, it must be changed in more than one place, which is more complex and may require more code than just changing it in one location. Following on from the previous point if data is duplicated, then it is easy to miss one of the duplicates when updating, leading to different copies having different information. This may lead to confusion, and errors further down the line.

* **Data dependence:**

File structure is defined in the program code so it is difficult to change the existing structure of the file and data. If the structure of the data file needs to be changed in some way (for example, to reflect a change in currency), this alteration will need to be reflected in all application programs that use that data file. This problem is known as physical data dependence, and will be examined in more detail later in the chapter.

* **Incompatible file formats:**

Programs are written in different languages, and so cannot easily access each other’s files. When each department had its own version of a file for processing, each department could ensure that the structure of the file suited their specific application. If departments have to share files, the file structure that suits one department might not suit another. For example, data might need to be sorted in a different sequence for different applications (for instance, customer details could be stored in alphabetical order, or numerical order, or ascending or descending order of customer number).

* **Fixed queries/proliferation of application programs:**

Programs are written to satisfy particular functions so if any new requirements are needed then it requires a new program. While a data file is being processed by one application, the file will not be available for other applications or for ad hoc queries. This is because, if more than one application is allowed to alter data in a file at one time, serious problems can arise in ensuring that the updates made by each application do not clash with one another. This issue of ensuring consistent, concurrent updating of information is an extremely important one, and is dealt with in detail for database systems in the chapter on concurrency control. File-based systems avoid these problems by not allowing more than one application to access a file at one time.

1. **Define the following terms**

**a) Database**

A database is an organized collection of data, generally stored and accessed electronically from a computer system. Where databases are more complex they are often developed using formal design and modeling techniques.

**b)      Database Management System (DBMS)**

A database management system (DBMS) is a software package designed to define, manipulate, retrieve and manage data in a database. A DBMS generally manipulates the data itself, the data format, field names, record structure and file structure. It also defines rules to validate and manipulate this data.

**c)      Application Programs**

An application program is a comprehensive, self-contained program that performs a particular function directly for the user. Application programs include: email, games, media players, etc.

**d) Data and Information:**

**Data:** Data is a raw and unorganized fact that required to be processed to make it meaningful. Data can be simple at the same time unorganized unless it is organized. Generally, data comprises facts, observations, perceptions numbers, characters, symbols, image, etc.

**Information**: Information is a set of data which is processed in a meaningful way according to the given requirement. Information is processed, structured, or presented in a given context to make it meaningful and useful.

1. **There are Five (5) major components in the DBMS environment: Hardware, Software, Data, Procedures and People. Explain briefly each one.**

Answer:

The five major components in the DBMS environment are:

* **Hardware**:

When we say Hardware, we mean computer, hard disks, I/O channels for data, and any other physical component involved before any data is successfully stored into the memory. When we run Oracle or MySQL on our personal computer, then our computer's Hard Disk, our Keyboard using which we type in all the commands, our computer's RAM, ROM all become a part of the DBMS hardware.

* **Software**:

This is the main component, as this is the program which controls everything. The DBMS software is more like a wrapper around the physical database, which provides us with an easy-to-use interface to store, access and update data. The DBMS software is capable of understanding the Database Access Language and interpret it into actual database commands to execute them on the DB.

* **Data**:

Data is that resource, for which DBMS was designed. The motive behind the creation of DBMS was to store and utilize data. In a typical Database, the user saved Data is present and meta data is stored.

* **Procedures**:

Procedures refer to general instructions to use a database management system. This includes procedures to setup and install a DBMS, to login and logout of DBMS software, to manage databases, to take backups, generating reports etc.

* **People**:
* **Database Administrators**:

Database Administrator or DBA is the one who manages the complete database management system. DBA takes care of the security of the DBMS, it's availability, managing the license keys, managing user accounts and access etc.

* **Application Programmer or Software Developer**:

This user group is involved in developing and designing the parts of DBMS.

* **End User**:

These days all the modern applications, web or mobile, store user data. How do you think they do it? Yes, applications are programmed in such a way that they collect user data and store the data on DBMS systems running on their server.

End users are the one who store, retrieve, update and delete data.