###### **Cairo University**

**Faculty of Computers and Information Information Systems Department Database Systems 1**

**Section 1 (Introduction to Databases)**

**A Database:** is a collection of related data designed for specific purposes.

**Data:** known facts that can be recorded and have an implicit meaning.

**Database Management System (DBMS):** a collection of software programs that are used to define, construct, maintain and manipulate data in databases.

A **database application** is a computer program whose primary purpose is entering and retrieving information from a computerized [database](https://en.wikipedia.org/wiki/Database).

**Mini-world:** Some part of the real world about which data is stored in a database. For example, student grades and transcripts at a university.

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| --- | --- |
| **File Processing System** | **DBMS (SQL)** |
| 1. Isolated files | 1. Related files or tables on database |
| 2. Programs to manipulate each file  Student data  Student program  Results    Faculty data  Faculty Program  Results | 2. It includes programs to manipulate DB  Student + Faculty DB  Student program  Faculty Program  Results  Results  DBMS |
| 3. The file system has no uniform structure | 3. Data stored in a DBMS has a uniform structure |
| 4. No query language | 4. Query language |
| 5. Programs dependencies; changes to one file require changes to application program | 5. Programs independencies; changes to DB require no changes to application program as the application programs do not deal directly with DB, it interacts with DBMS |
| 6. No backup and recovery | 6. Backup and recovery exists |

**SQL**: Standards for Structured English Query Language.

**How the data stored in the database using SQL?**

The data stored in the database as tables. For example the figure below shows a simple database that includes information about the students and their departments.

|  |
| --- |
| **Student** |
| Student Id **(PK)**  Student \_Name  Student \_Age  Student\_Address  Dept\_id **(FK)** |

|  |
| --- |
| **Department** |
| Dept Id **(PK)**  Dept \_Name |

**Where**

1. Student\_Id, Student-Name, Student\_Age, Student\_Address, Dept\_Id, Dept\_Name are called table fields or attributes.
2. Each table must have a **P**rimary **K**ey that uniquely indentifies each table record and this PK must satisfy both uniqueness and Not Null conditions as here Student\_Id and Dept\_Id.
3. In the table student the Dept\_id is considered as a **F**origen **K**ey which represents the relation between student and department tables, FK can accept null but must have the values that are only included in its master table (i.e Dept\_id cannot be equal 5).

|  |  |
| --- | --- |
| **Dept\_Id** | **Dept\_Name** |
| 1 | CS |
| 2 | IT |
| 3 | IS |
| 4 | OR |

**Note:** if we include Student\_Id in the department table as a FK

instead of including Dept\_id in the student table we will violate the

**Column**

uniqueness condition for Student\_Id as a PK.

**Row/record**