DATABASE MANAGEMENT SYSTEM(DBMS)

-INTRODUCTION AND OVERVIEW OF DBMS

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Summary of Basic Definitions of DBMS

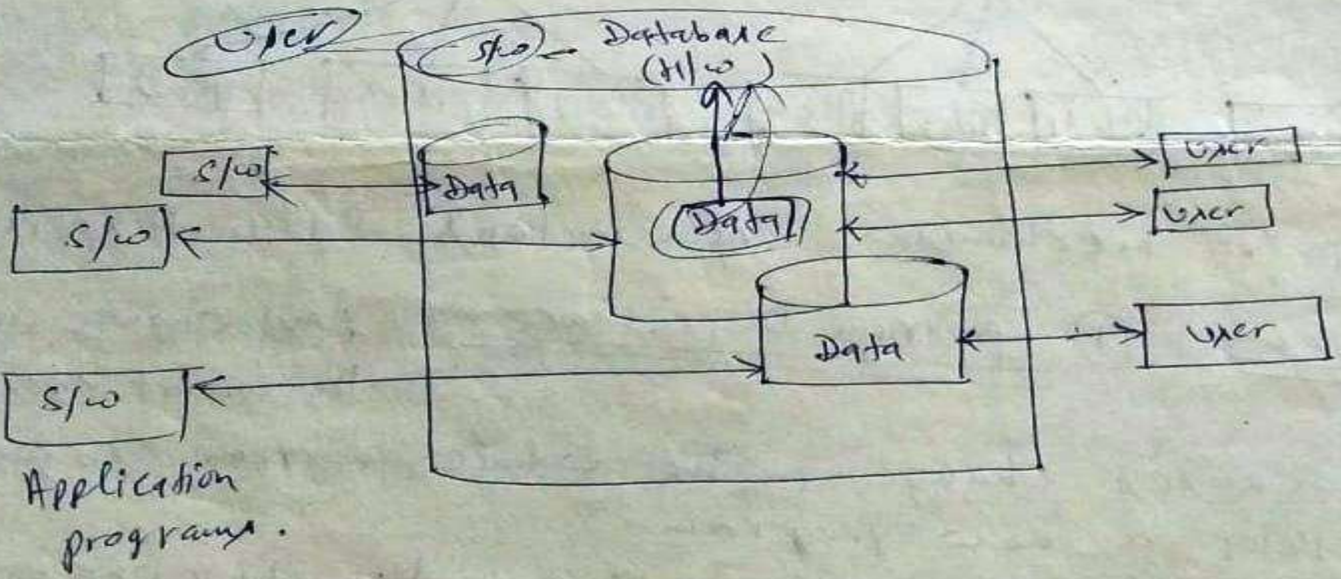
- **Database:**
  - A collection of related data.
- **Data:**
  - Known facts that can be recorded and have an implicit meaning.
- **Mini-world:**
  - Some part of the real world about which data is stored in a database. For example, student grades and transcripts at a university.
- **Database Management System (DBMS):**
  - A software package/ system to facilitate the creation and maintenance of a computerized database.
- **Database System:**
  - The DBMS software together with the data itself. Sometimes, the applications are also included.

Database Systems (or) DBMS ⇒ DBMS S/w with the Database is called Database System

DBMS software + Database = Database System.

It's purpose to record & maintain Information.

4 Major components → ① Data ② H/w
③ S/w ④ Users.



② H/w ⇒ It have 2 types. ① processor & Main Memory that supports in running DBMS. ② Secondry storage Device i.e HDD, Magnetic Disk.

③ S/w ⇒ It exists b/w physical DB & users.

Typical DBMS Functionality

- *Define* a particular database in terms of its data types, structures, and constraints
- *Construct* or Load the initial database contents on a secondary storage medium
- *Manipulating* the database:
  - Retrieval: Querying, generating reports
  - Modification: Insertions, deletions and updates to its content
  - Accessing the database through Web applications
- *Processing and Sharing* by a set of concurrent users and application programs – yet, keeping all data valid and consistent

Typical DBMS Functionality

- Other features:
  - Protection or Security measures to prevent unauthorized access
  - “Active” processing to take internal actions on data
  - Presentation and Visualization of data
  - Maintaining the database and associated programs over the lifetime of the database application
    - Called database, software, and system maintenance

Example of a Database (with a Conceptual Data Model)

- **Mini-world for the example:**
  - UNIVERSITY environment.
- **Some mini-world *entities*:**
  - STUDENTs
  - COURSEs
  - SECTIONs (of COURSEs)
  - (academic) DEPARTMENTs
  - INSTRUCTORs

Example of a Database (with a Conceptual Data Model)

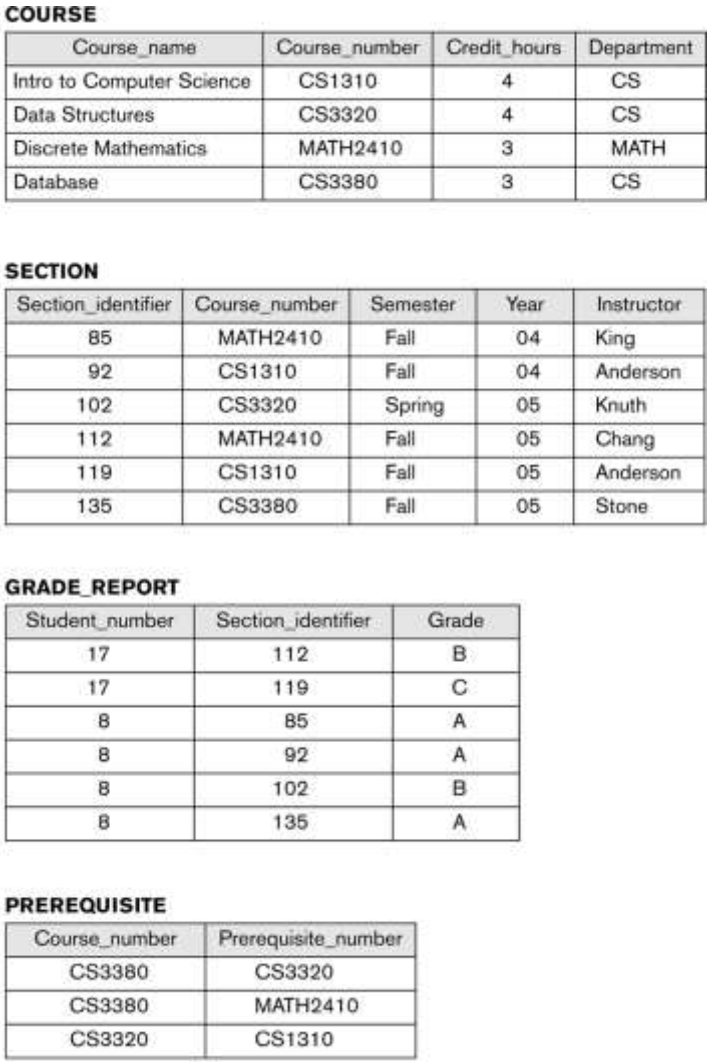
- **Some mini-world *relationships*:**
  - SECTIONs *are of specific* COURSEs
  - STUDENTs *take* SECTIONs
  - COURSEs *have prerequisite* COURSEs
  - INSTRUCTORs *teach* SECTIONs
  - COURSEs *are offered by* DEPARTMENTs
  - STUDENTs *major in* DEPARTMENTs

- Note: The above entities and relationships are typically expressed in a conceptual data model, such as the ENTITY-RELATIONSHIP(E-R Model) data model.

Example of a simple database

STUDENT

Name	Student_number	Class	Major
Smith	17	1	CS
Brown	8	2	CS



COURSE

Course_name	Course_number	Credit_hours	Department
Intro to Computer Science	CS1310	4	CS
Data Structures	CS3320	4	CS
Discrete Mathematics	MATH2410	3	MATH
Database	CS3380	3	CS

SECTION

Section_identifier	Course_number	Semester	Year	Instructor
85	MATH2410	Fall	04	King
92	CS1310	Fall	04	Anderson
102	CS3320	Spring	05	Knuth
112	MATH2410	Fall	05	Chang
119	CS1310	Fall	05	Anderson
135	CS3380	Fall	05	Stone

GRADE_REPORT

Student_number	Section_identifier	Grade
17	112	B
17	119	C
8	85	A
8	92	A
8	102	B
8	135	A

PREREQUISITE

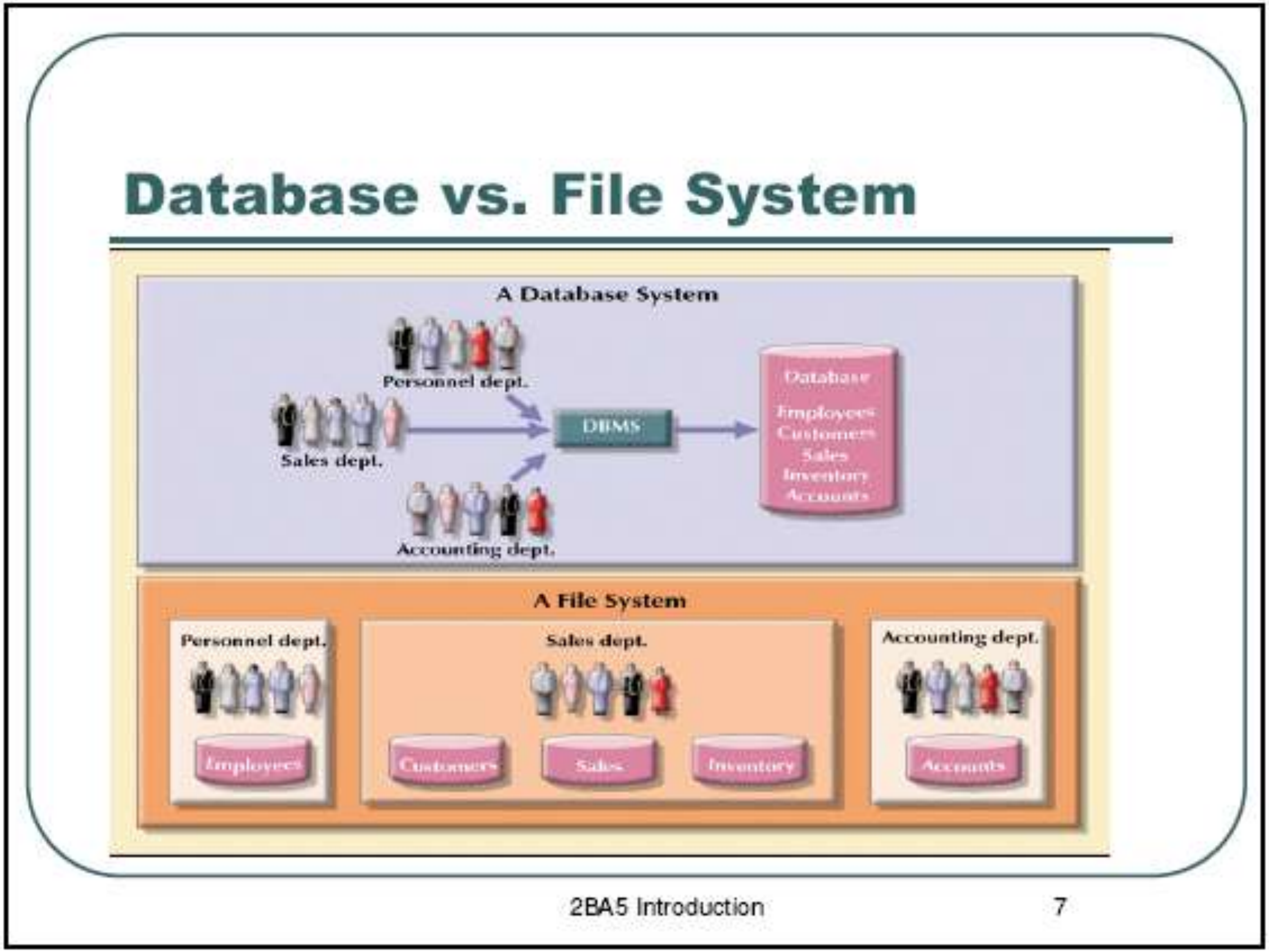
Course_number	Prerequisite_number
CS3380	CS3320
CS3380	MATH2410
CS3320	CS1310

Figure 1.2
A database that stores student and course information.

The Database Approach Vs File Processing Approach

- In traditional file processing, each user defines and implements the files needed for a specific application.
  - redundancy in defining and storing data.
  - wastes storage space and effort used to maintain the common data up-to-date.

- In the database approach, a single repository of data is maintained that is defined once and then is accessed by various users.



Database vs. File System

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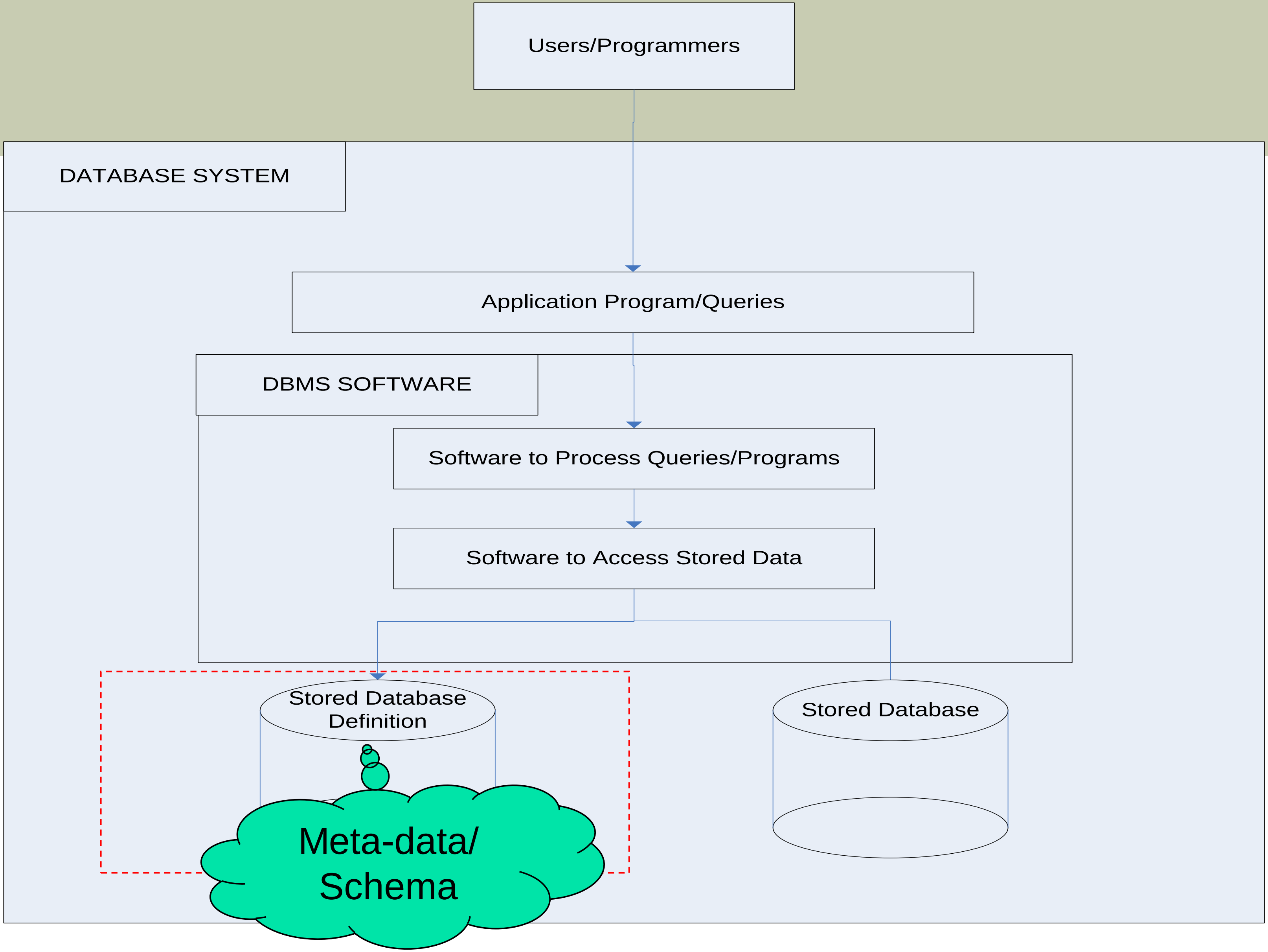


Users/Programmers

DATABASE SYSTEM

Application Program/Queries

DBMS SOFTWARE

Software to Process Queries/Programs

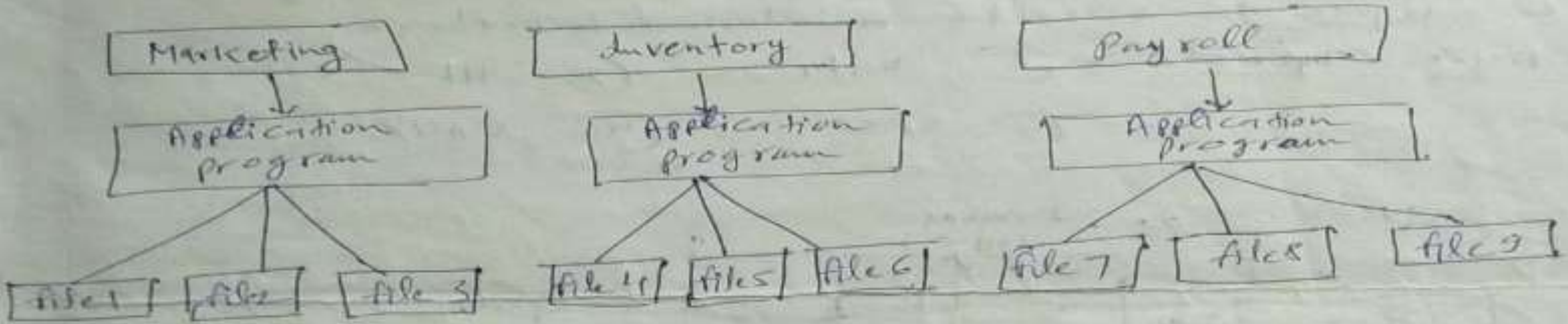
Software to Access Stored Data

Stored Database Definition

Stored Database

Meta-data/ Schema

Traditional file System ⇒ In it, Each file is Independent of Other file, & data in different files can be Integrated only by writing Individual program for this Application.
Any change to data require modifying all the programs that uses Data. This is because each file have its own data type etc.



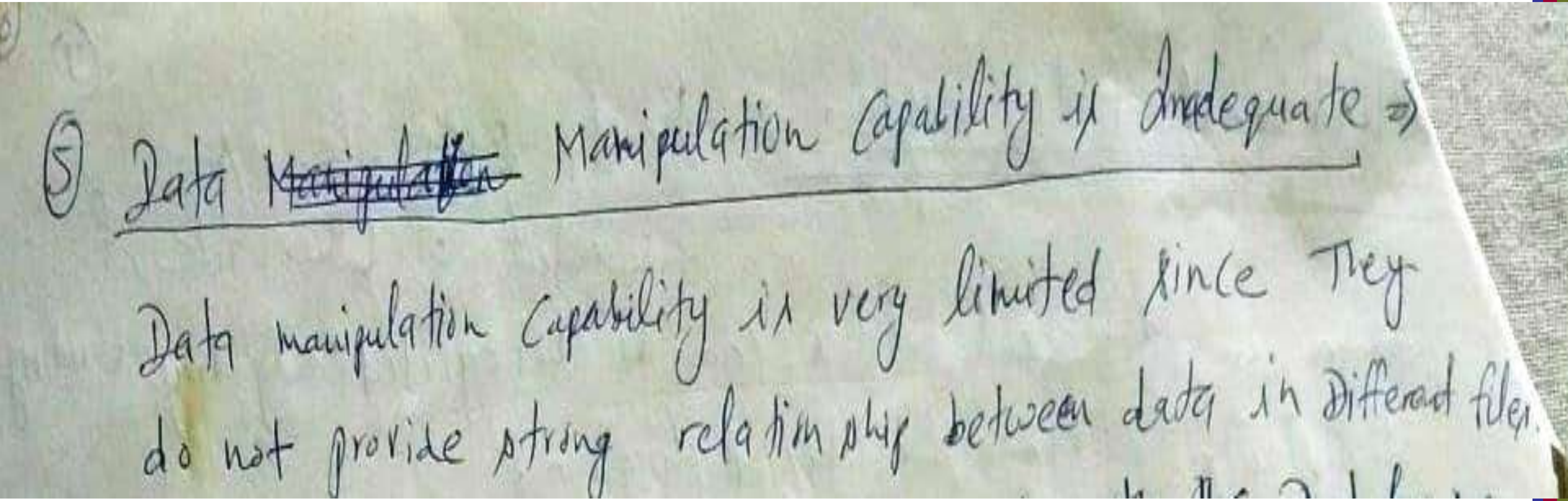
In this type of mechanism organization's Data Disperses.

Disadvantages ⇒ ① program Dependence → Any change in the format or structure of data causes change in the whole program. so we have develop a new program.

② Limited Data sharing ⇒ Each Application has its own private files & users have little choice to share the Data outside their own Application.

③ Poor Data Control ⇒ file system was decentralized in ~~[illegible]~~ nature. same data in Different Departments.

④ Problem of Security ⇒ It is very difficult to enforce security checks & access Rights, because Application programs are added in adhoc manner



⑤ Data ~~Manipulation~~ Manipulation Capability is Inadequate =>

Data manipulation Capability is very limited since They do not provide strong relationship between data in Differad files.

Advantages of Using the Database Approach

- Controlling redundancy in data storage and in development and maintenance efforts.
  - Sharing of data among multiple users.
- Restricting unauthorized access to data.
- Providing persistent storage for program Objects
  - In Object-oriented DBMSs
- Providing Storage Structures (e.g. indexes) for efficient Query Processing

Advantages of Using the Database Approach (continued)

- Providing backup and recovery services.
- Providing multiple interfaces to different classes of users.
- Representing complex relationships among data.
- Enforcing integrity constraints on the database.
- Drawing inferences and actions from the stored data using deductive and active rules

Advantages of DBMS over file processing System ⇒

(1) Data quality is high ⇒ In it quality of Data is good. This is possible due to presence of tools & processes in DB system.

(2) Minimal program Maintenance ⇒ Due to program changing in Applications, It causes high maintenance effort required. It is not in DB system due to presence of tools & Data Independence

(3) Concurrency control ⇒ It manage simultaneous (Concurrent) access of DB by many users. It prevents any loss of Information.

(4) Less cost ⇒ due to centralized enviorment or Central D.B.

(5) Improved Backup & Recovery ⇒ By DBA.

(6) Conflicting requirements can be balanced ⇒ DBA resolve conflicting requirement of users & application by knowing overall requirement of the organization.

(7) Increased programmer productivity ⇒ DB system provide standard function that the programmer written. Availability of these functions are convenient for users. This reduces the Development time & cost.