

DATABASE

SYSTEMS

BSE : 4th

Semester

24/6/24

④ File Handling:

If data persistence or storage required , then file handling is performed .

→ RAM volatile

→ Form of file:

① txt ② CSV ③ Excel

→ It is not feasible for too much large data to manipulate

→ For this purpose, we use efficient method of storing .

✳ Database System:

To store or

retrieve data efficiently .

E.g: Banking system etc....

→ Database Management System.
(DBMS)

(Software to interact system)

→ Python

↳ Google colab

: Notebook → section → code → output

: Easy work environment.

* Python:

→ No data type for python.

Var = "Text"

Var1 = 12

Var2 = 12.5

arr = [1, 2, 3.5, "Hi", 6, "Bye"]

→ Iteration:

```
for i in arr:  
    print(i)
```

: index
and
tab
based
code

OR

```
try:  
    if (i % 2 == 0):  
        print("even")
```

: not
works
str for
mod
operator

except

 print("string") .

→ Input :

 name = input ("Enter your name")

 semester = input ("Enter your semester")

 cgpa = input ("Enter your CGPA")

 print ("Name", name, "Semester", semester, "CGPA", cgpa)

 : "input" is of string type
 (we can typecast it)

→ Typecast :

 type (cgpa) : str

 typecast :

 cgpa = float (cgpa)

 type (cgpa) : float

④ Input till user enter -1 :

 : i=0

 ": " block
 start

 while (i != -1) :

try

 i = input ..

 i = input ("Enter number")

except

 print ("Enter
 Numeric..")

 i = int (i)

→ File Handling:

```
file = open("data.txt")
```

: Reading of
file

```
data = file.readlines()
```

```
for line in data:
```

```
    print(line)
```

: return
list of
lines
: array
stored
lines

```
file.close
```

: Comment:

→ Text Split:

```
text = "Apple,10,150"
```

```
arrsplit = text.split(",")
```

```
for i in arrsplit:
```

```
    print(i)
```

⑤ Data file and show it in
the form of:

: RollNo = BSEF22MD33, Semester=5,
CGPA = 3.5

(coding)

```
→ file = open("data.txt")
```

```
data = file.readlines()
```

```
for text in data:
```

```
arrsplit = text.split(',')  
print("Roll No =", arrsplit[0], "Semester =",  
      arrsplit[1], "CGPA =", arrsplit[2])
```

*+① Class code :

yhjz3t3

*+① Using Database system to
store data of web application
(Project of Semester).

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④ File Handling for data Persistence:

arr = []

arr.append(1)

arr.append(2)

print(arr[1])

arr2 = [1, 2, 3, 4, 10, 19, 41]

for element in arr2:

 print(element)

arr2.append(51)

arr2[3] = 52.

arr2[8]
arr2.sort().

① Function:

→ def test(var):
 return var * 2

No return
type
mention

→ def myfunc():
 print("Hello myfunc")

② Calling:

test(10)

myfunc()

: first
function
be defined.

③ Return largest element of list:

→ def LargestElement(arr):

LargeEle = arr[0]

for i in arr:

 if (i > LargeEle):

 LargeEle = i

return LargeEle

$\rightarrow \text{arr} = [10, 90, 52, 89, 1004, 0, 1]$

$\text{max} = \text{Largest Element}(\text{arr})$

$\text{print}(\text{max})$.

* ④ Hometask (run all array operations)
Quiz next class.

④ Dictionary:

Dictionary \rightarrow Key, value Pass : Hashing

`myData = {"Name": "Aisha", "rollNo": "BSEF22M03",
 "CGPA": "3.5"}`

: Syntax:

{ Key : Value Pass, Key:Value Pass }

: `print(myData["Name"])` : Aisha

`myData["CGPA"] = 3.8` : updated

: `myData["semester"] = 5` : added

④ with open:

`with open("data.txt") as f:`

`lines = f.readlines()`

`for line in lines:`

`print(line)`

: automatically
closes
the file

```
record = line.split(",")
my rec = { "rollNO": record[0],
(Dictionary)           "Semester": record[1],
                           "CGPA": record[2] }
```

* def getData(filename)

records = []
with open(filename) as f8:

lines = f8.readlines()
for line in lines:

print(line)

record = line.split(",")

my rec = { "rollNO": record[0], "Semester":
record[1], "CGPA": record[2] }

records.append(my rec)

return records

→ records = getData("data.txt")

for i in records:

print(i)

print("RollNo:", i["rollno"],

"Semester:", i["Semester"],

"CGPA:", i["CGPA"])

: Key name must in quote.

→ Write data:
(New file made if not present)

: r: read (default)
w: write
a: append (old data
will be deleted)

: with open("data.txt", mode="w") as

writer.write(newrecord)

writer:

: with open("data.txt", mode="a") as
writer:
writer.write("BSCE22H06
Y, 3.8")

writer.write(newrecord)

* def writeRecord(records filename):

with open(filename, mode="a") as
writer:
(Lines = writer.readlines)

for data in records:)

writer.write(records["rollNo"] + "
records["semster"] + ")" +
records["cgpa"] + "\n")

: with open(filename, mode="a") as

recordsStr = record["rollNo"] + ", "
str(record["semster"]) + ", "
str(record["cgpa"])

writer.write(recordstr)

writer.write(record)

(Not accept dictionary argument) : writer.
(so converted into string) write(string)

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① File Data Format:

→ Entity (Person, place, concept processing) (Data store of group or company)

② Person, place, concept about which we need to store/persist data.

③ Entity has attributes and behavioural functions.

④ Student

| | | |
|---|---------------|----------|
| { | name | dept |
| | father-name | semester |
| | rollno | |
| | age | cgpa |
| | date of Birth | |
| | CNIC | |
| | interest | |
| | degree | } |

To manage
we need
mechanism

① Database:

② Table: It is a collection of rows and columns.

primary key
unique identifier

Student

| rollno | name | semester | cgp a |
|------------|--------|----------|-------|
| BITF22M001 | Aisha | 4 | 3.5 |
| BITF22M002 | Amna | 4 | 3.6 |
| BITF22M003 | Aarifa | 4 | 3.7 |
| BITF22M004 | Aira | 4 | 3.8 |

③ Issues:

→ Inconsistency
(abrupt pattern)
of Data

(File system consistency
achieving is difficult)
(so we use DB).

: Data must
be
consistent

④ Relation / Table:

Conceptual data

Structure . It is of type
 $n \times m$ (rows) (columns) . This data structure
is provided by DBMS .

④ We can insert, update and delete data.

⑤ DBMS Language → SQL

(structured Query Language)

⑥ parts:

DDL → Data definition language

DML → Data Manipulation language
(Today lecture)

⑦ Structured Query Language

(Projection)
(Visualization)
SQL:

(Insert)
Update
Delete → UML → Queries

→ Query has Keywords:

Select Anyrow.

from table-name

→ It is a not case sensitive language.

⑧ e.g. Select rollno, name

from student;

: Select and from are primary queries.
otherwise syntax error

⑨ Select * → returns all data

* Select first-name, age from customers.
(only two columns data)

* Conditions:

Select *

from customers

where column \equiv " "
↓ operator ↓ value

○ Eg:

Select *

from customers

Where country = "UK"

: where ages
20

: Select * from customers

where age > 22 and country = "UK".

* Write query where customer
only buys Keyboard.

Select * from orders

where items = "Keyboard".

* Only Keyboard or Mouse.

Select * from orders

where items = "Keyboard" OR items = "Mouse"

④ Status is delivered:

Select * from shipping

where status = "Delivered".

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* Primary Key (which identifies the each column uniquely).

(+) Model (structure) (To understand working)

(+) Physical Model

→ How actually data is stored on storage medium.

Conceptual

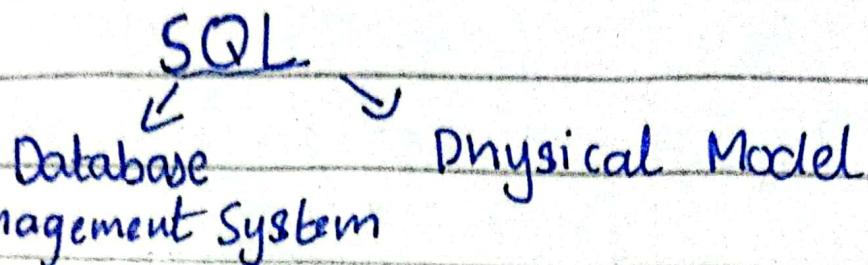
Model
(Data Model)

→ How conceptually data is stored one conceptual Model is relation model in which data is stored in the form of relations/ tables

(+) University CMS Model (Attendance, Subjects (Add/Drop), Fees, Exam etc....)

(+) Physical Model (Base Terminology)
(Database System). (How data is stored on hard disk)

* ①



② Table → Relation of Rows and Columns

③ Conceptual Model

Non-Relational Mode

Relational model
(Database)

⊕ ④ Data Model:

→ Relations / Table

→ Columns

→ Data type

→ Constraints

→ Primary Key

→ Software architect responsibility
to define data model

**

* ⑤ Chapter #1 (Homework) (Read it)
(Next class discussion)

* ⑥ Data (Raw facts and figures) and
Information (Processed Data)

* ⑦ Metadata (Data about Data)
(which describes your data to manage
DBMS)

④ End-Users (Any system designed user's) (E-commerce sites have products , price data).

⑤ DBMS (Database management system) (Collection of programs that manages database structure and control access and stores data).

⑥ Types of Database (Book pg # 34)

Single-user

(Microsoft Access)

(Desktop database)

Multi-User

(Workgroup database)

(Oracle SQL)(Enterprise)

⑦ Database Design (Activities that focus on design)

* File Processing (study it by yourself)

⑧

SQL

Database
Design

(DDL)
(Data definition
language)

Database
manipulation

(DML)
(Data manipulation
language)

→ Select
From
Where

:Keywords
(In-sensitive)
:Comparison
(sensitive)

* : Friday Class (11:30 - 1:30)
 Thursday Lab (2:30 - 5:30)

①

Employees

| emp-code | emp-Name | dept-Code | Salary | Manager |
|----------|----------|-----------|--------|---------|
|----------|----------|-----------|--------|---------|

① Select * from Employees where
 salary between 5000 AND 25000

→ select * from Employees ^{where} salary >= 5000
 AND salary <= 25000

→ only deptno 1

: select * from Employees where
 dept-Code = 1

→ select * from Employees where
 dept-Code = 1 AND Manager = 1

② IN:

→ select * from Employees where
 emp-Code = 1 OR emp-Code = 3 OR emp-Code = 5

OR

→ select * from Employees where
 emp-Code (IN) (1, 3, 5) : (Better way)

③ LIKE:

→ select * from Employees where
 emp-Name Like 'A%': (For
 starting letter).

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→ File System Drawbacks:

- ① File Structure Dependant
- ② Extensive Programming
- ③ Lack of Security and data sharing.
- ④ Difficult of getting quick answers.
- ⑤ Complex administration.

→ These drawbacks urge to move towards database.

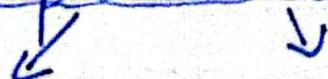
* Structural Dependence:

One thing change will change all the structure.

* Structural Independence:

After changing schema, no effect on structure.

* Data Representation:



Data Physical Data Logical

* Data Redundancy:

(Repetition) Difficult in File System.

- Inconsistent (Sales Department and HR)
- Data Entry Error.

* Data Anomalies:

- Update Entry
- Inserting Entry
- Deleting Entry.

* Database Systems:

An organization's
of components, that collects, stores, usage
and manages data.

→ Components:

- ① Hardware
- ② Software
- ③ People (Administrations, designers, analyst, programmers)
- ④ Procedures
- ⑤ Data

* Chapter Exercise (Solve it)

* Table / Relations:

| ROLL NO. | Name | Semister | CGPA |
|----------|------|----------|------|
| 1 | Ali | 4 | 3.5 |

Data →
(Student Entity)

④ Rollno — Numeric
Name — String
Semester — Numeric
CGPA — Decimal

⑤ Primary Key : (PK)

Columns which identifies table uniquely and to achieve integrity constraints.

⑥ Meta-data:

Data about data.
Dictionary Data - Additional information about data.

⑦ Database Management:

Access control and management data integrity constraints.

⑧ Database Career Opportunity:

- (i) Database Developer
- (ii) Database Designer
- (iii) Database Administrator
- (iv) Database Analyst
- (v) Database Architect (who choose which conceptual model)
- (vi) Database Consultant.

(vii) Database Security officer

(viii) Cloud Computing Data Architect.

* Quiz Chapter #1 on ~~wednesday~~

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CHAPTER # 2

④ Data Model:

Graphically representation of business rules . use to design database.

→ All requirements and business rules Kept in view to design database.

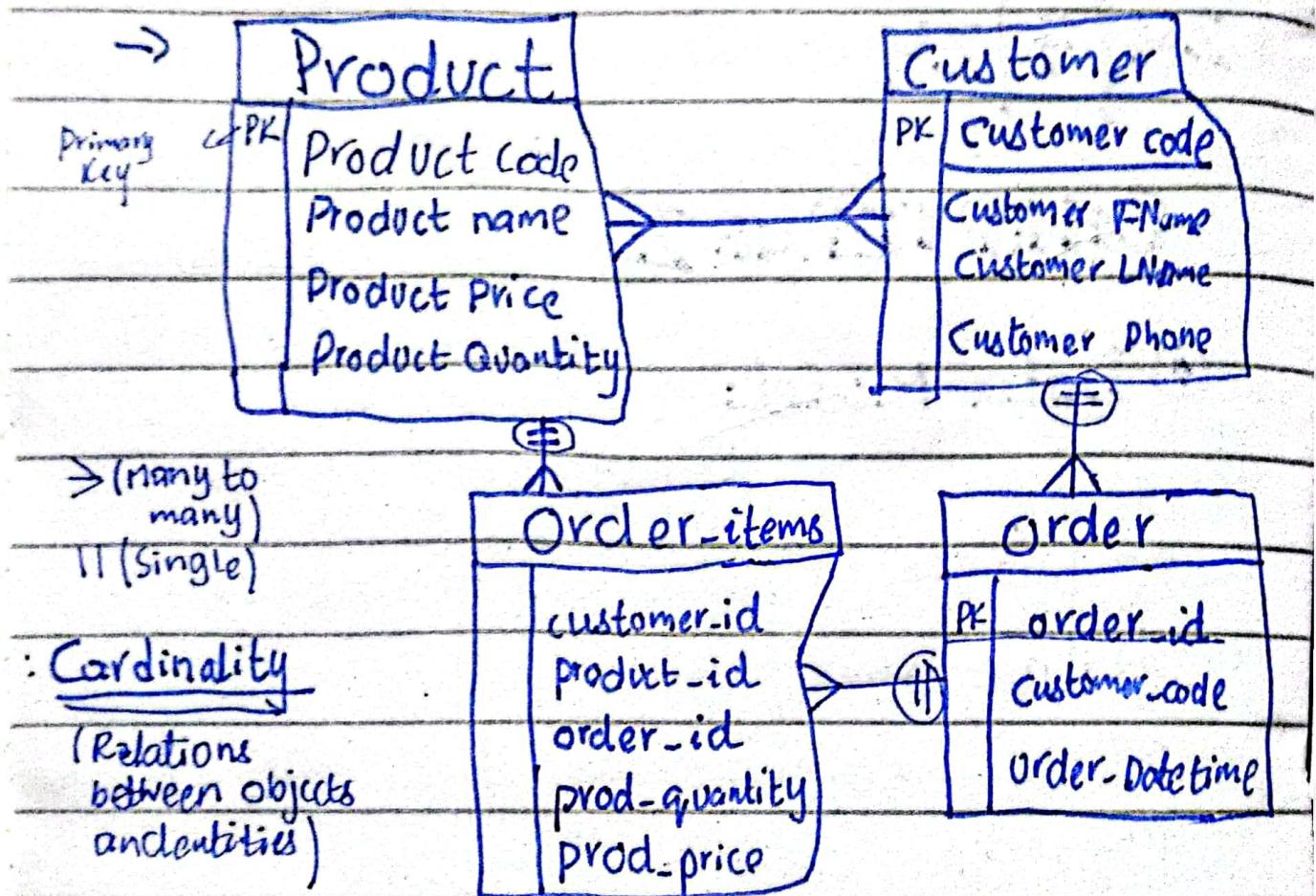
* " Graphical Representation of business rules in particular business document".

⑤ Entity:

Concept or ideas of person, place organization, product.

→ Product has quantity , has price.

- Customer has name, phone number.
- Order has product, customer, date and time.
(Entity: Product, Customer, Order)



- ④ Single attribute primary ^{key} and composite primary Key.
- ✳ Entity instance must be distinguishable.
- ✳ Attribute (Characteristics of Entity)
- ✳ One-One, One to Many and Many to Many (relations)