

## \* Chapter three :-

1

Relational Model used insted of 1- Hierarchical Model  
2- Network Model.

Idea :- Organize data as a group of Relations, each relation describes a group of object with similar attributes

\* Schema :- Description with - out data (for columns)

example students (sid : string, name : string, login : string  
age : integer, gpa : real)

⇒ The previous schema says that each record in the students relation has five fields [field name & type]

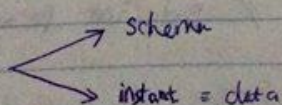
\* instance = data

Schema	sid	name	login	age	gpa
- redundant :	53666	Jane	Jane@cs	18	3.4

\* We can Note that : Database now is a collection of one or more relations  
each relation is Table

\* We will use "MySQL" to 1- query 2- manipulate data 3- relations

\* DML : Data Manipulation Language  
DDL : Data definition Language

\* Relation 



Degree : # of columns (field, attribute)

Cardinality : # of rows (record, tuple)

Mysql has server : something used by more than one & used to store data

\* Mysql Syntax : [Case Sensitive]  $\Rightarrow A \neq a$  and so on

- Show databases, // to show the <sup>all</sup> ~~used~~ databases
- Create database university, // create a database called univ.
- Press ctrl + Enter to execute one row
- Press ⚡ to execute whole program (create/drop database named database;)
- Use university; // Use <sup>database with name</sup> university
- drop <sup>database</sup> university; // To delete

Ex create a table for student

CREATE TABLE Student (

<sup>Reserved word</sup>  
int

s\_id

Sname Varchar (32),

birthdate date,

gpa Real,

Primary Key (s\_id);

← auto id pls not Semicolon

// s\_id int Primary Key ✓

Create table st; // Error, At least Put one column



if Variable is PK, it define Not Null

3

- show Tables; // To show all tables in data base
- show create table students; // To show student's table without data

Ex How to show data ?

Ans Select \* From Students;

Ex How to add another att. <sup>columns</sup> for table students ?

الحل : دuplicat : دuplicat ← عكس اقلية إلى اكثر الالبته  
duplicate

Two Solutions I drop table then rebuild

2) <sup>تعديل</sup> ALTER Table Students add major Varchar(16);

Ex How to add the att (column) at certain place ?

ALTER Table students add major Varchar(16) after birthdate;

\* Inserting data \*

Insert Into Students Values (1152233, 'Ahmad', 1980-02-20, ...), <sup>عنا وجد</sup>

or Insert Into Students (sid, name) Values (... , ...);

Note int = Integer  
Varchar (11) ⇒ up to 11  
char (11) ⇒ 11



### \* Slides Example :-

- Delete from Students where name = 'Smith'
- Update Students Set

age = age + 1, gpa = gpa - 1  
where sid = 53688

این چهار تغییر است : %  
عین مطلوب است

PRIVILEGES :

آهن سلاخ ← دراست

~~Alert~~ If this Message was appear

" You are using safe update mode and you tried to update a table without without ... "

Solution Edit → Preferences  
SQL Editor → uncheck " safe updates "  
ok  
Reconnect to server

\* drop table Students ;

\* delete from Student where sid > 100 AND sid < 200



## Integrity Constraints Over Relations

تقييد سلامة العلاقات

\* IC :- (Integrity Constraints)

Is a condition that is specified on a database schema and restricts the data that can be stored in an instance of the database.

Key Constraints :- Statement that a specific minimal subset of the fields of a relation is a unique identifier for a tuple

القيود الرئيسية :- (1) (tuple) هي عبارة عن مجموعة من القيم (Constraint) = Label Key

No subset of fields in Key is a unique identifier for a tuple (2) Key is minimal

\* Keys :-

(1) Composite Key : Composed of more than one attribute  
ما يتكون من أكثر من سمة واحدة  
مثال : الرقم القومي يتكون من الرقم الأول و رقم العائلة

(2) Key attribute : Any attribute that is a part of Key

(3) Super Key : Any Key that uniquely identifies each row  
من خلال رقم واحد أو أكثر  
مثال : الرقم القومي و الرقم الأول



4) Candidate Key :- a super Key with out redundancies  
نفس المبرر كى بس بول تكرار

Note < Key من شىء يكون الكى تاعى  
الحكم انى نخلص اولى للنا  
unique access <=

NULL

- ⇒ 1) No data entry  
2) Not permitted in primary Key  
3) should be avoided in some attribute  
4) can be represent @ an unknown attribute value  
⑥ a known "missing" attr. value  
⑦ not applicable condition
- عن صفرى كى  
NULL ← PK

Note 1) Key is Minimal something  
2) Super Key is Not Minimal (Key + sth)

Ex does Key is super Key?  
⇒ T. Key always minimal

Ex does super Key is Key?  
F, super Key is not minimal

\* Sid integer not NULL ; // يجب استخدم بول صفرى  
سا بول صفرى

Example alter table students add major varchar (20)  
not NULL after birthdate;

Remember:- Create table students (  
 sid int Primary Key , ✓  
 of sid int ,  
 Primary Key (sid) , ✓  
 sname varchar (20) not null ,  
 gpa real ) ,  
 89.9 جواب ←

Note Constraint EmpPK Primary Key (EmpID) // P.m. Key  
 it → Label with const.

Note Constraint EmpPK Primary Key (EmpID, skillID)  
 Composite Primary Key using constraint

Note a combination of PKeys  $\Rightarrow$  super Key  
 $\Rightarrow$  a pair of entity can have at most one relation

PK: Constraints اجابة لا غش



## Foreign Key :

\* Key : جدول و يوجد به  
 Key : جدول في الجدول الثاني  
 Foreign Key : الجدول الثاني

PK	Sid	name	age	FK	Sid	Cid	grade
	1	Ahmed	20		1	database	80
	Students			References Relation		Enrolled	

Ex Write \_\_\_\_\_ enrolled table in MySQL ?

Ans create table enrolled (

Sid char (20),

Cid char (20),

Primary Key (Sid, Cid),

\* Foreign Key (Sid) References Students (Sid),

FK (Sid) ref students (Sid)

FK (Cid) ref course (Cid)

✓ has info

✓ has info

IC (Int. Cons.) : state that every value of  
 FK must match a value of an  
 existing PK



Ex Example from slides on FK

Create table Emp-Skill (

EmpID integer not null,  
SkillID integer not null,  
SkillLevel integer,

Constraint EmpSkillID Primary Key (EmpID, SkillID),

Constraint EmpFK Foreign Key EmpID  
References Employee (EmpID), ON Delete Cascade ①

Constraint SkillFK Foreign Key SkillID  
References Skill (SkillID) ON update Cascade ②

① ⇒ if EmpID row deleted <sup>المحذوف</sup> ⇒ PK  
EmpFK is ~~deleted~~ deleted ⇒ FK

\* Drop ~~remove~~ table employee : also remove data ⇒ <sup>المحذوف</sup> Constraint

Ex How To remove a constraint ?

⇒ Use Alter & drop

Alter table employee drop Constraint EmpFK;

IC : <sup>المحذوف</sup> حذف الإضافة من الجدول



شؤون الطلاب

\* Foreign Key

← استعمل في مثال الطالب راسات

1) يعني في row له id غير موجود في student

2) في row من student

Both affected  $\Leftarrow$  delete/update  $\Leftarrow$  Cascade A

None is affected  $\Leftarrow$  Reject  $\Leftarrow$  No Action B ON UPDATE NO ACTION

Both affected  $\Leftarrow$  Set Null / Set default C

\* Constraints Not Null

Unique : متفردة column في جميع

Default : اعطى قيمة افتراضية

Check : مكان افعلها الرأ اي تبطل ولا مع



# ER Diagram To Relational Model

Entity  $\Rightarrow$  Tables

Attributes  $\Rightarrow$  column In table

Cardinality Ratio

$M \times N \Rightarrow$  id class  
 $M - 1 \Rightarrow M$  id class  
 $1 - 1$

AK

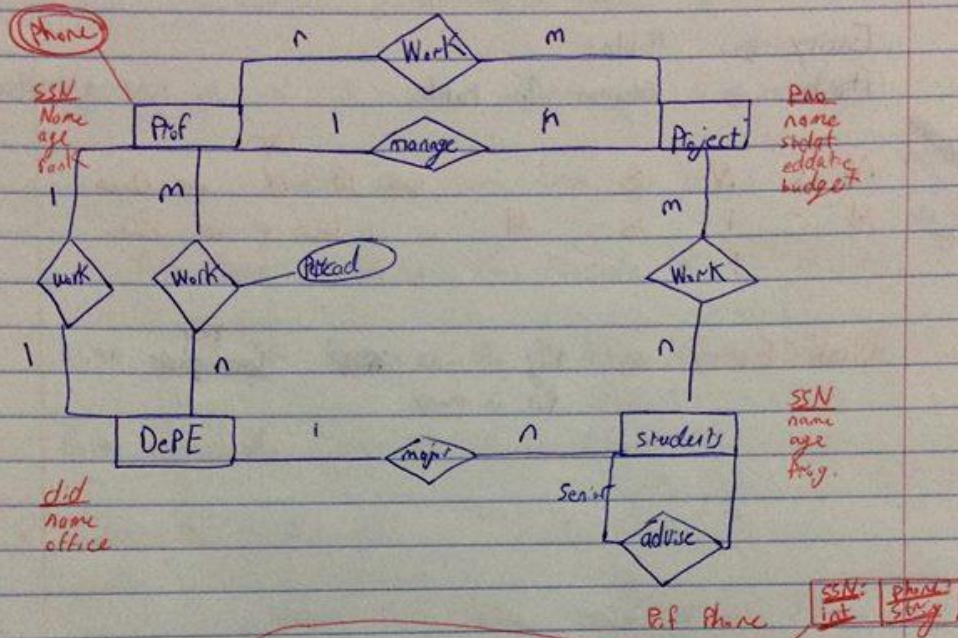
Weak Entity  $\Rightarrow$

Key of one  
Part in many

Key  
~~Key~~



Ex For the following ERD, find schema?

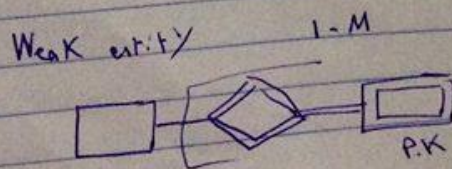


Prof  
SSN: int, name: string, age: int, rank: int

Prof 2 Proj Work  
SSN: int

Proj  
Pno: int, name: string, start date: date, end date: date, budget: int

1:1 ⇒ Merge into 1 ball and use





## \* Schema :-

Find the Schema for Musicians Example

- ① There is a table for each entity
- ② Merging :  $M \cdot N$  a new table  
 $M : 1$  a Merge to M side (Musicians & Inst)  
 $1 : 1$  )
- ③ ——— not null  $\leftarrow$  small null etc

musicians ( SSN : int, name : String, phone : String )

address ( phone : String, street : String, city : String )

Instrument ( inst\_id : int, name : String, numKeys : String )

mus2Inst ( SSN : int, inst\_id : int )

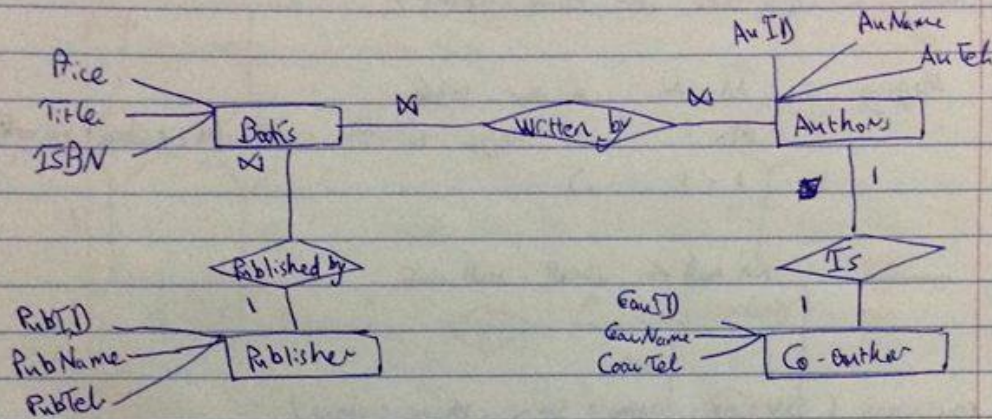
Song ( Song\_id : int, title : String, author : String, Alb\_id : int )

mus2Song ( SSN : int, Song\_id : int )

album ( Alb\_id : int, title : String, release : date, Prod : int )  
 musician  $\leftarrow$



- Question
- ① Write the schema for ERD below
- ② Write SQL Statement to create all tables for the system represented by the ERD below



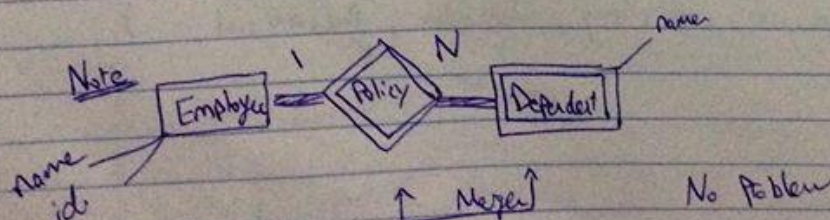
Ans ① Books ( ISBN : String, Price : Int, Title : String, PubID : String )

Authors ( AuID : int, AuName : String, AuTel : String, CoauID : String )

Book 2 Author ( ISBN : String, AuID : int )

Publisher ( PubID : String, PubName : String, PubTel : String )

Co-author ( CoauID : String, CoauName : String, CoauTel : String )

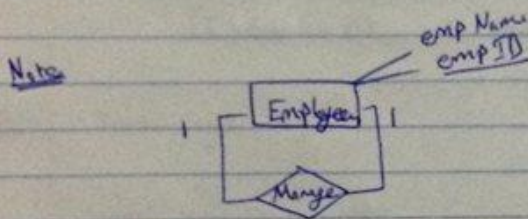




string  $\begin{cases} \rightarrow \text{char} \\ \rightarrow \text{Varchar} \end{cases}$

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- ③ Create Table Books (  
ISBN Varchar (20),  
PubID Varchar (20),  
Primary Key (ISBN),  
Foreign Key (PubID) references Publisher  
);



And schema  $\Rightarrow$  Emp (gee (empID : int, empName : String, ManagerID : int))

Note Class Hierarchies are only for Hourly Emp & Contract Emp

