

Subject:

Date:

What is Database?

Databases

- any collection of related information} can stored in different way
- o Phone Book → to do lists → shopping list → your best friends → Facebook user page
 - o on paper → on computer → in your mind. This power part of comments section etc.

= Library

Data base management systems (DBMS)

- Special software program that helps users create and maintain a database.

- o make it easy to manage large amounts of information,
- o handles security : - only people has username and password can access data
- o Backups → taking and export data from other resources
- o importing & exporting data → From other sources
- o interact with software apps
- o concurrency

CRUD

Create Read Update Delete

or Retrieve
Delete

→ Four main operation in database

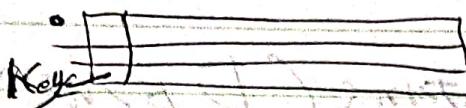
- ① creating information ; creating new database,
- ② reading // , retrieving or getting info from database
- ③ update →
- ④ deleting /



2 main types of Database

Relational databases (SQL)

- Organizes data into one or more tables



- unique Key identifies each row

→ Most Popular

Like: excel Sheet

	Name	Major	username	password
1	Ali	-	20190101	Ali123
2	Aseem	-	20190102	Aseem123
3				
4				

RDBMS

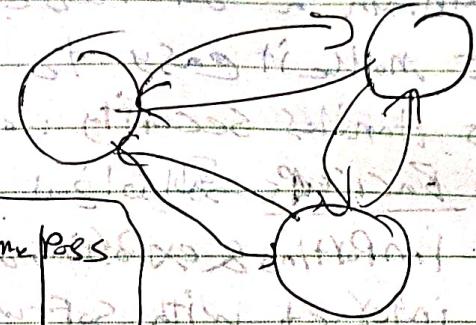
- MySQL, Oracle, PostgreSQL, MariaDB, etc
- Structure query language (SQL)
- Standardized language for interacting with RDBMS
- used to perform C.R.U.D. Operations
- Define tables and structure



Non Relational databases (NoSQL) (not just SQL)

- organize data into anything but not relational databases like Graphs

- Key Value Stores
- documents (XML, JSON, etc)
- Flexible Tables



Helps user to create Non Relational DBs

MongoDB, dynamoDB

Apache Cassandra

Firebase

no Standard language

structured data

unstructured data

semi-structured data

big data

real-time data

mobile data

internet of things

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Data base Queries

- Queries are requests made to the database management system for specific information
- Google search is a query system created by Google

wrap up

- Database is any collection of information
- Computer are great storing database
- DBMS make it easy to create, maintain and secure a database
- DBMS allows you to perform the C.R.U.D operations
- Two types of Database, Relational & non Relational
- Relational databases use SQL and store data in tables with rows and columns with key values for every row
- non Relational data store data using other data structures



Relational Data bases

Relational model

Tables (Rows, Columns)

attribute (أtribute) و Table (جدول) كل الـ 5

row (رسالة) attribute (أtribute) #

PRIMERY KEY

attribute

Attribute

	ID	emp_name	joining_date
Tuples	1	Asma	2019-11-15
	2		
	3		
	4		
	5		

ORACLE

SQL SERVER

MySQL

POSTGRESQL

SQL Server

SQL Structure Query language

Table :- كل جدول نوع البيانات كل جدول يحتوي على 3 things
 Schema , Primary , Nulls both معرفة في المقدمة

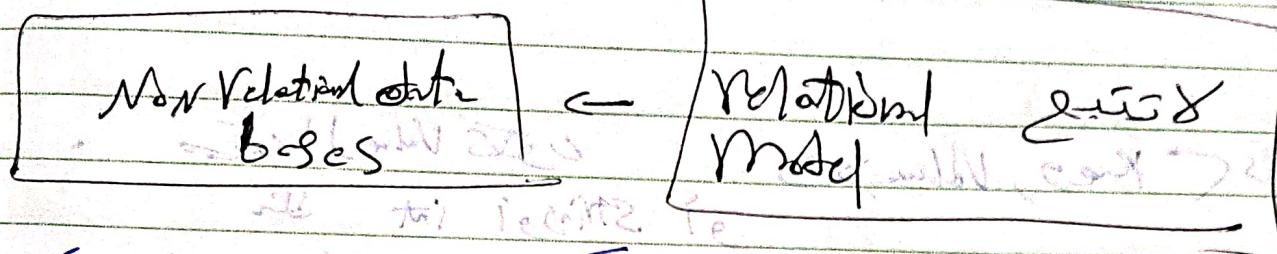
Schema is Pre defined



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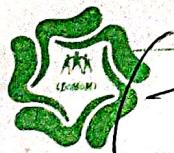
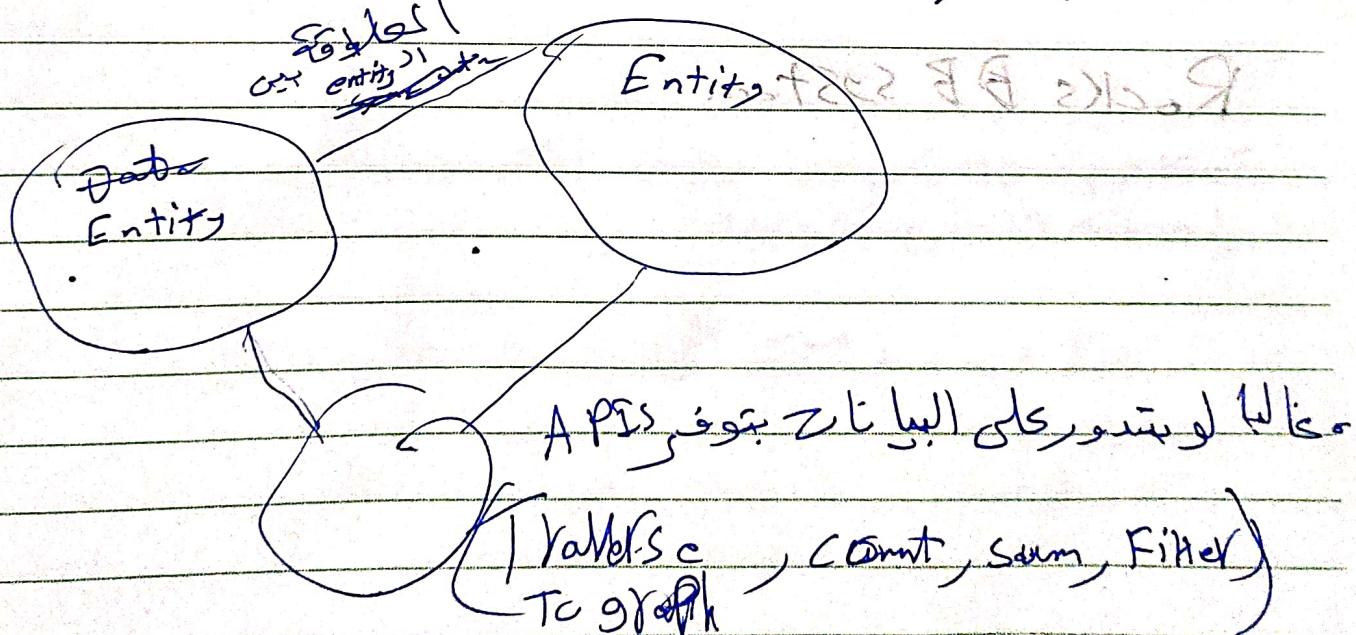
NoSQL Data bases



يعنى الأشياء مصنوعة من الكتل تكون كل فم ينتمي إلى إحدى هذه الكتل

- Schema is Flexible
- في معظم الأحيان نحتاج إلى (رفراف) schema لتدخل البيانات وعلي أساسها أن تقدر (DDI) حيث
- Graph systems (بيانات مترابطة)

أنواع NoSQL.



Tiger graph CosmoDB

Subject:

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Key Value databases (2)

Parts \langle Key, Value \rangle مكونات \langle مفتاح، قيمة \rangle مكونات .
وهي String int like .

This leads to its complex structures .
and uses the same they represent objects like this .

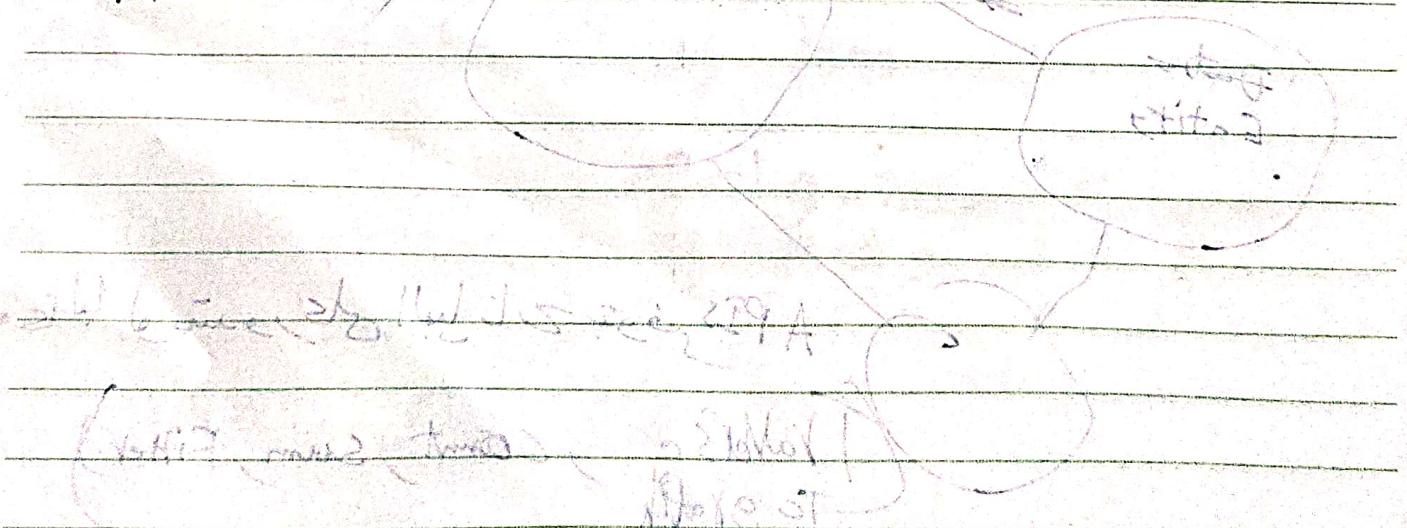
Key Hash table .

Key \rightarrow hashing Key \rightarrow Value \rightarrow صيغة table .
مثلاً table .
and access time: $O(1)$.

لهم لوكس لوكس فاسخاً دعى . Point Query 2 like .

Like Hash Database (HDB) Caching .

Rocks DB system .



8/7/2023 10:01 AM

Subject:

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wide columns stores (3)

list of all keys of (columns values)

all columns are part of one entity

① cassandra

② Google big table

Documents database (4)

Semi-structured document

XML Document

OR

JSON

Fields (أمثلة على المفهوم) معرفة بـ key-value

Document (موجود) Collection (موجود)

nesting of objects

① MongoDB

② Couchbase



Subject:

Date:

⑤ Data Organization

Shopping orders

Mango JB

Relational Data

~~30m. 10 ft.~~

~~order~~

Customer Date Location

order Ed;

156	Bob	6/10/2023	1-2
168	Alice	i	i
162	Carl	i	i
150 items			

	line	Item	QTY	unit price
156	1	Note	5	5 \$
156	2	Pen	6	10 \$
160	1	TV	7	1000 \$
160	2	lap top	1	4000 \$
162	3	Chair	9	120 \$

No Normalized

قسم الصدور 2
عنوان سائل (الماء أو الحبر)
اسم (الستريك)

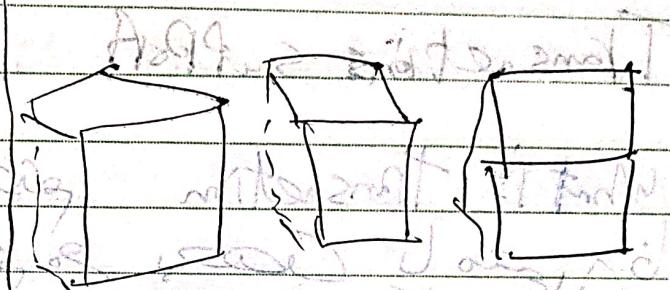
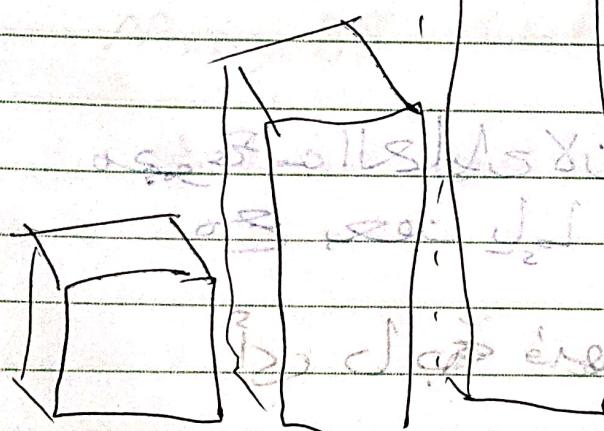


Subject: Scaling

Date:

Vertical Scaling

Horizontal Scaling



Increase or decrease

The capacity of existing service

الخدمات الحالية

Relationships between

IS Vertical Scaling
(has limits)

	Name
1	Aff
2	Asem
3	No

	City	City
1	Lis	Mashilla
2	London	London
3	London	London

ID	name	city
1	Aff	Mashilla

ID	name	city
2	Asem	London
3	No	London

Sharing

Date: _____
Subject: NoSQL database (horizontal data) (يعني) Data Model
جامعة الملك سعود

مختصر الـ partitioning
وهو تجزيء البيانات
لتحقيق الأهمية documents
بمعنى أن كل جزء موجود فعليه

Transaction Support

ما هو الغرض من التعامل مع transaction
عند بحث البيانات؟
أي طبقة فنية

B ← A صار 100\$ لو حصل

① Subtract 100\$ A, B, C 100\$
في نفس الوقت لازم أدولو حصل العليناء

لتسلق الوقوع

A set Properties

Transaction Properties

① Atomicity: Each transaction is "all or nothing"

② Consistency: Data Should be valid according to
all defined rules

B Isolation

Transaction doesn't
affect each other

D Durability

committed data wouldn't be lost

Subject:

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Relational Database

Supports access Properties

NoSQL

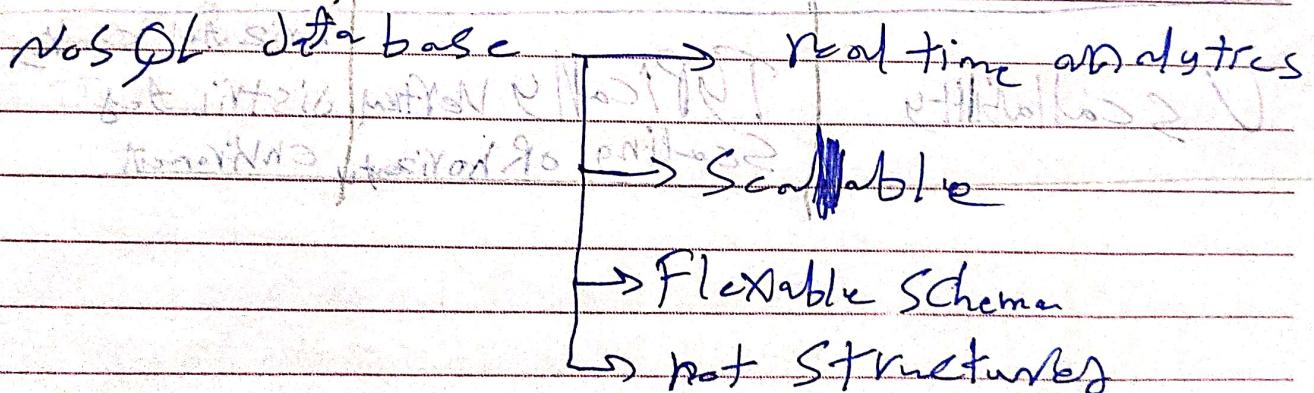
يجعلك قوياً ويسهل لك اخذ واعطاء
Properties

MongoDB Supports Transactions

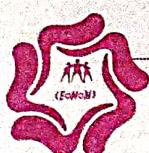
Relational Databases support Transactions
and ACID properties

Complex Queries

Data Structures \rightarrow Relational databases



	SQL DB	No SQL Data bases
Structure	Relational structures Tables with Schemas	Non Relational: Flexible data model
Query language	Standards SQL	Varied specific database types
Flexibility	well defined Schema Less Flexible	Flexible Schema easily adaptive to changes
Data integrity	ACID Compliant Strict data consistency	Eventual consistency Volatile data consistency
User cases	Transactional system Complex queries	Biz data, real time analytics, Flexible Schema
Scalability	Typically vertical scaling or horizontal scaling	horizontal scaling for distributed environment



Steps

- ① Gathering Requirements
- ② DBMS Selection
- ③ Analysis
- ④ Logical Design
- ⑤ Physical D
- ⑥ Creation and Run SQL

① Gathering Requirements

- ① أنواع البيانات المختلفة
- ② Queries
- ③

② DBMS Selection

- ① Structured Data
 - ② Graph and Stream
 - ③ JSON or XML
- نوع البيانات
- نوع البيانات
- نوع البيانات

Graph Data دو ابرو الاتا وخدمات الراي دو
 Traverses مارس (93) 10016 9712015101 11111
 updates inserts على و لا يرتكز Analytical داد دو
 queries

Scalability و قابلية التخصيص Customized as per requirement (P) دو



هي الضروريات الـ 4 ← Relationshipulis

③ Analysis

model \rightarrow Requirements (لـ تصور
المطلوب)
Tables \rightarrow نماذج
المعلومات

eg list of all users

في النهاية نكون Tables مترابطة من نوع

one-to-one relationship توضح كل الـ data كـ المثلثات

one-to-many relationship

many-to-many relationship

① Entities

② Attributes

③ Relationships - between entities

Entity Relationship diagram (ER)



Subject:

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① Entities

ممكن تكون طبقات (1) People (2) Organization (3) Locations
ممكن تكون موارد (1) Customer (2) Employee (3) Supplier

② Attributes :-

Entity Fields

Customer → اعماليات → كل وظائفهم يبيانها في ملخص

entity

Attributes

Customer

Name

Address

Email

③ Relationships :-

① one to one

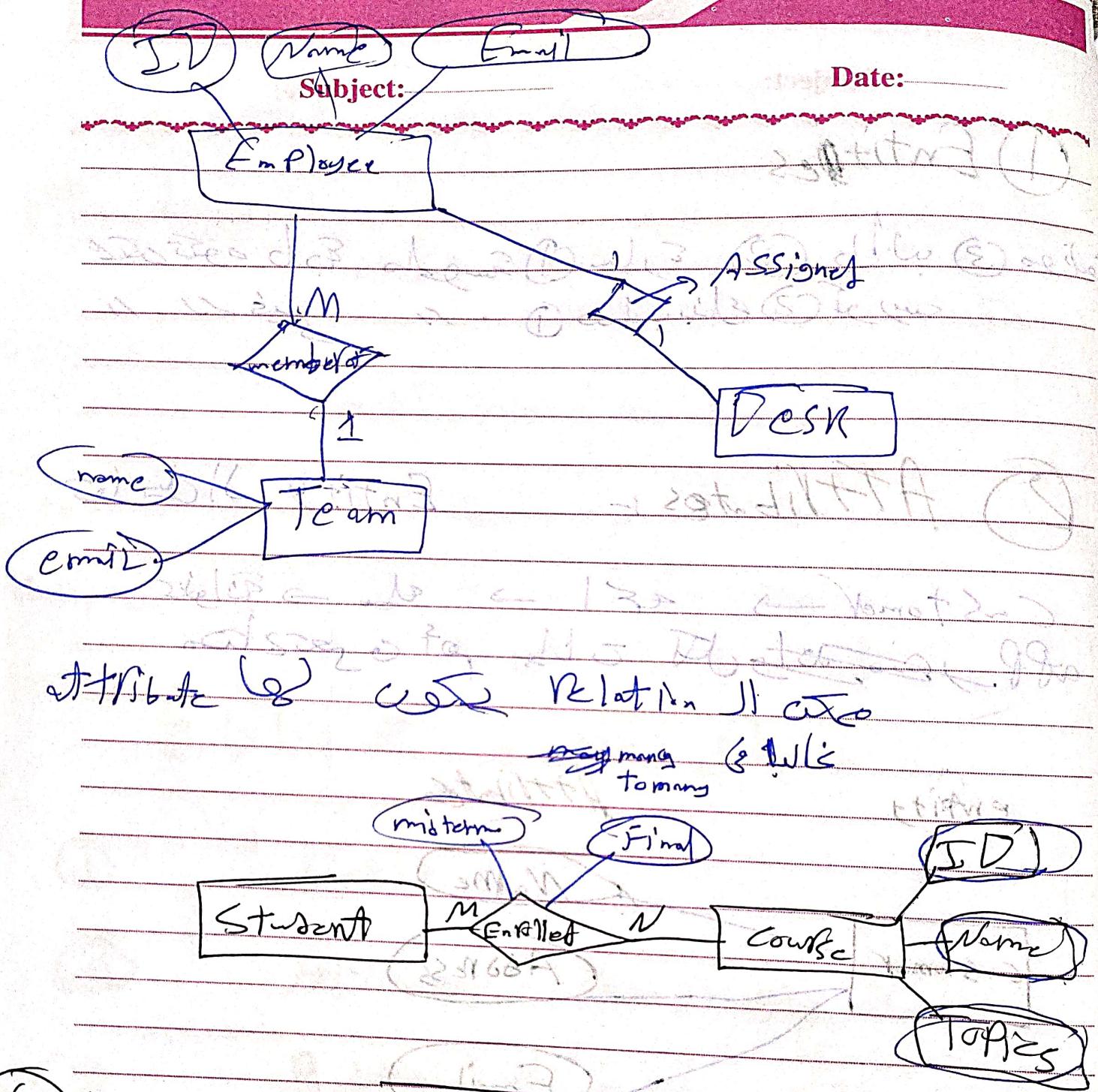
كل موظف له مكتب

② one to many

كل موظف له العديد من المهام

many to many

student → course ← student



4 Logical design

Tables ← diagrams ← ندول او سينكل بدل لى ال
 Foreign Keys . Primary Key . متعدد
 تبع على كل Table . مفتاح اصلى

مفتاح اصلى

نحو سينكل الداتا معها ← Normalization



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⑤ Physical design

نحوه الـ physical System او الـ logical System
الـ Data Types (Non Relational) ارباعي
او الـ Data Types (Relational) اربعون
وهو ما يسمى physical System

⑥ Creation

⑦ maintenance

Relationship Subject

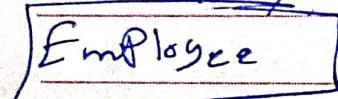
• Connection between entities

- Employee works at company

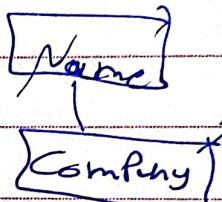


Student Studies Course

enroll
enrol

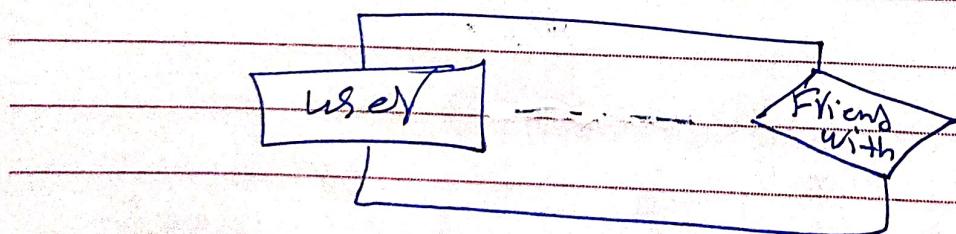


works in

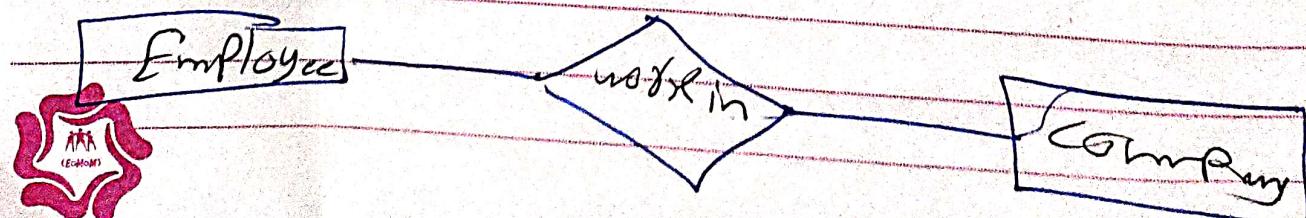


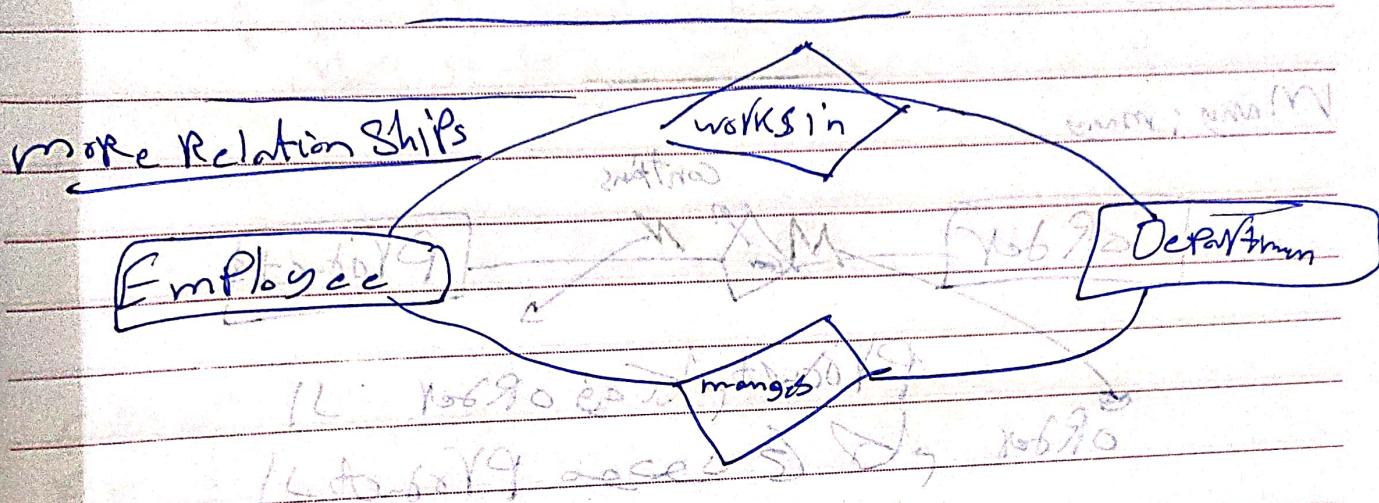
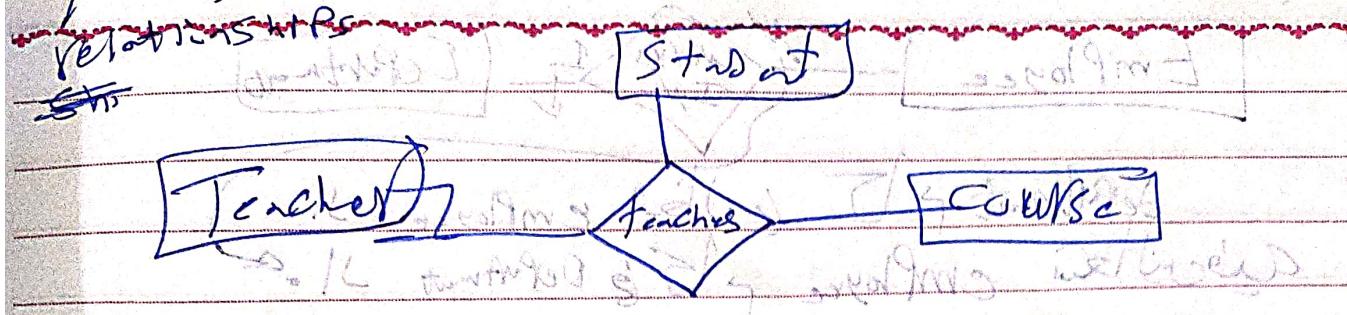
Properties of Relationships

① Degree \rightarrow Unary relation (Degree = 1)



② Degree \rightarrow Binary relation (Degree = 2)



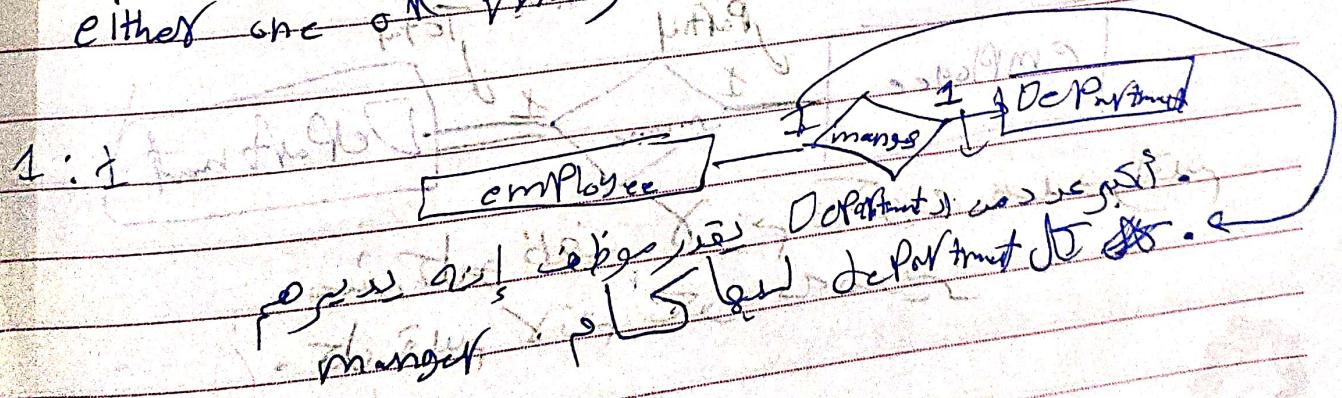


2 Cardinalities

maximum number of entities instances connected by the relationships

objects from entities \rightarrow instances

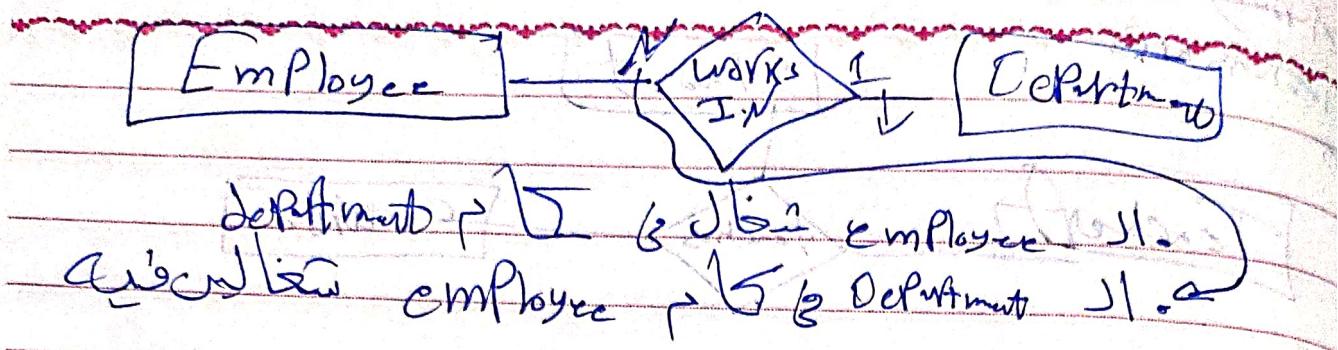
either one or many



Many to 1

Subject:

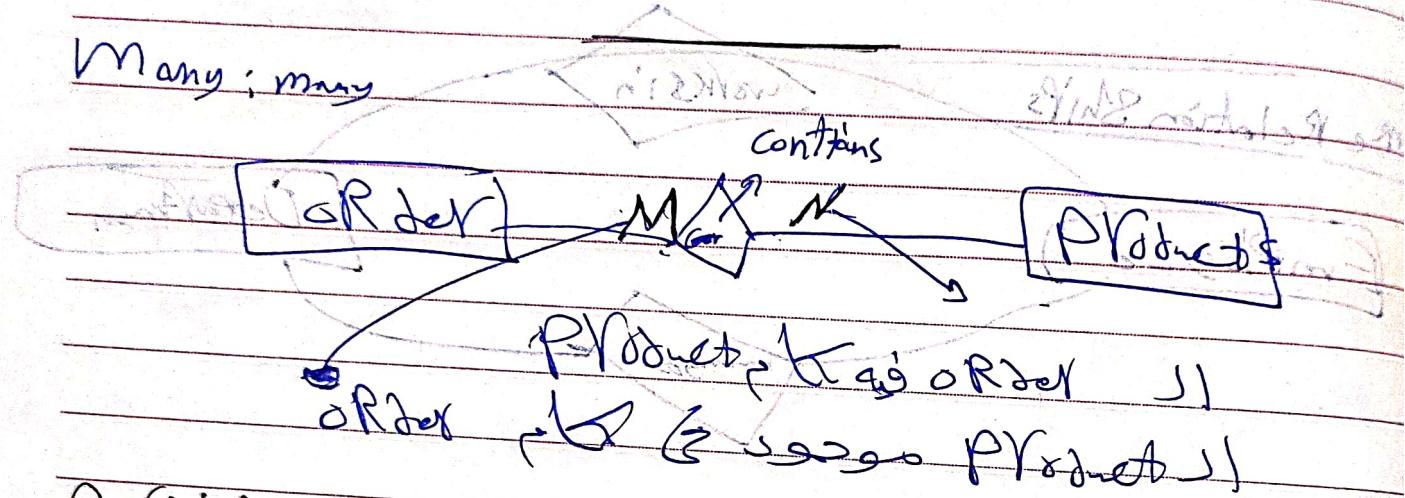
Date:



Department \rightarrow 1 (one) employee exist.

One employee \rightarrow 5 (5) Department \rightarrow .

Many ; many



Product \rightarrow May X Order \rightarrow
Order \rightarrow (2 many Product)

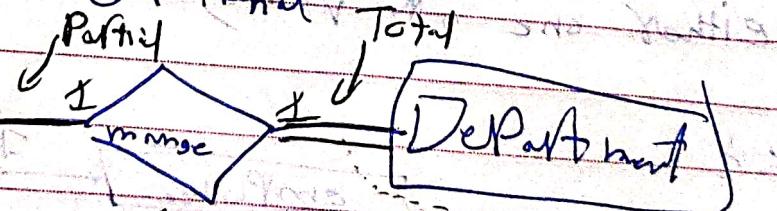
Participation :- how entities participate in relationships

Total OR Partial participation

Does every entity instance have to participate

Yes \rightarrow Total = mandatory

No \rightarrow Partial = optional



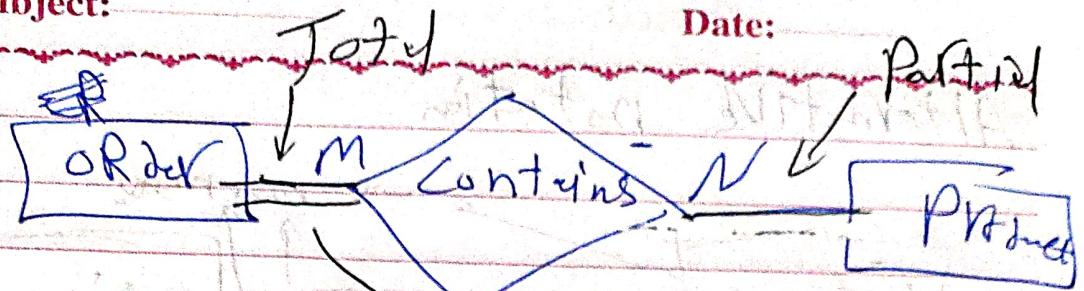
مثلاً في المدرسة كل طالب يدرس في قسم ما
ولكن ليس كل طالب يدرس في كل قسم.

Total



Subject:

Date:



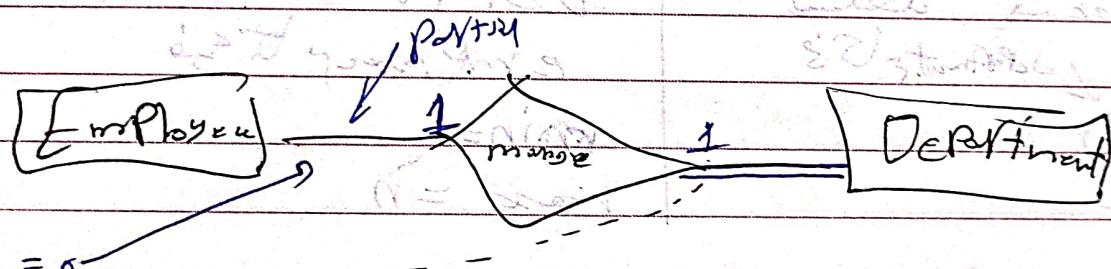
Product and order have order.
order has product & product has order.

Cardinality & Participation

Cardinality → one or many → (maximum)

Participation → (0) or (1) → (minimum)

Employee manages Department



min = 0

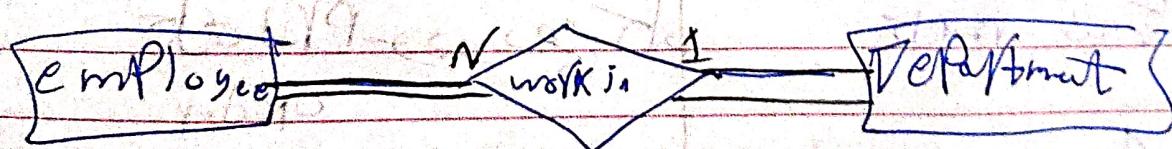
max = 1

Employee manages Department

Department → 1 Employee

min = 1

max = 1



Employee خالد

Dept काम करता है

min = 1

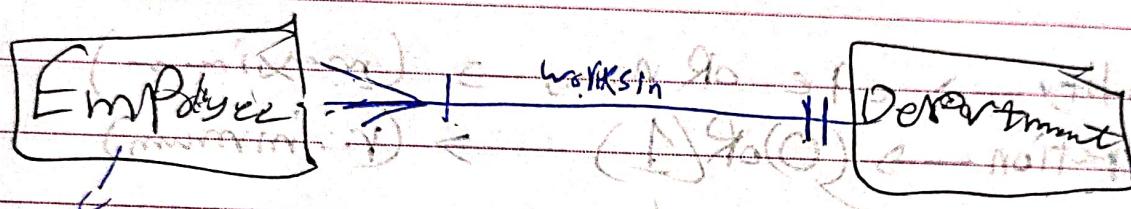
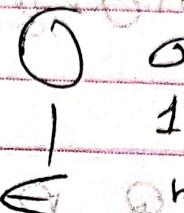
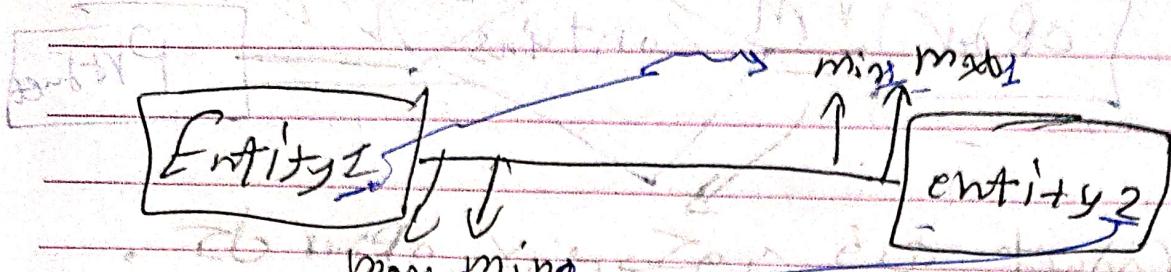
max = 1

Dept → काम करने वाले Employee

min = 1

max = N المصطحب

Alternative notation



Employee → 1 to n
Department 1 to 1

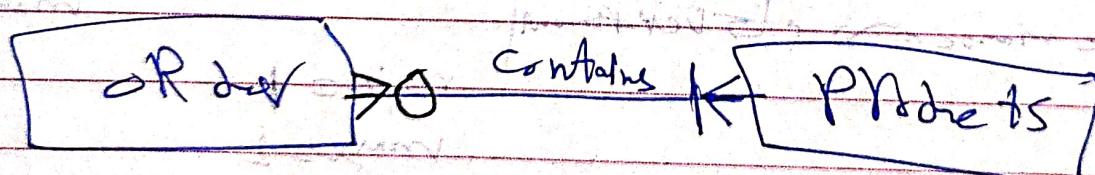
min = 1

max = 1

Department
Employee تبعه
min = 1
max = n

min = 1

max = n



Product has order

min = 1

max = N



Order وجد في Products

min = 0
max = N

Subject:

Keys

Date:

① What is \rightarrow Key : - one or more attributes that can be uniquely identify a row (tuple) of data.

Key with 1 attribute: Simple Key

// // multiple attributes: Composite Key

② Superkey: - \rightarrow able to identify attributes \rightarrow Email & Name | Email & Age | Email & Email | Email \rightarrow simple Superkey
Email & Name | Email & Age | Email & Email | Email \rightarrow minimal Superkey
Email & Name | Email & Age | Email & Email | Email \rightarrow composite key

minimal Superkey \rightarrow must be able to identify data

subset of any Superkey \rightarrow minimal Superkey.

minimal Superkey is Candidate Keys \rightarrow may be simple OR composite



لوجلر انجام وز آنچه \rightarrow Primary key (اصلی کوئی) \leftarrow ودی مسکن عوایل email سنبھالنے کے لئے Candidate Keys کا زمکون

→ you take email priority key → just 8 bytes

any other candidate key is called \Rightarrow Alternative Key

- Primary Key → one of candidate keys
 - unique
 - not nullable
- stable (shouldn't change)
- simple or composite

الكلمة المفتوحة Natural Keys

• Extra horizon \rightarrow [I'd] \rightarrow Surrogate Keys

• تاریخ الگویی دادا بوسنی

