

Data Model:

① A collection of conceptual tools for describing

— Data

— Data relationships

— Data semantics

— Data constraints

② Describe the design of a DB at physical, logical, view levels.

③ Example

1) Relational model

2) Entity - Relationship model (E-R)

3) Object-based data model

4) Semi-structured data model (XML)

Relational model

Data stored in table

"Faculty" Table

4 attributes

ID	Name	Dept	Salary
1	Chandu	CSE	75000
2	Ashf	CSE	125000
3	Jimson	EE	150000

Entity: faculty

Attributes: { ID, Name, Dept, Salary }

one record: one row

3 records
Tuples

SQL Structured Query language

— widely commercially used

— SQL is NOT a Turing Equivalent language

— to compute "complex funcⁿ": SQL is embedded in some higher-level languages

— Application prog^s access DB through one of the
→ languages extension interface (JDBC / ODBC)
→ which allow SQL queries to
sent to DB

DB design

logical design: find relational scheme

— what attributes?

— Attribution distⁿ among scheme.

R1

ID	Name	Salary	Dept	Building
→ A001	E XYZ	95000	Physics	Block - IV
A002	Ram	145300	CSE	Block - II
→ A003	Rahim	75000	Physics	Block IV
→ A010	Utkal	150000	Physics	Block - IV
A011	Sripam	150000	CSE	Block - II

Redundancy
↓
potential anomaly

R2

ID	Name	Salary	Dept
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R3

Dept	Building
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Tuple: a sequence of a list of values
n-tuple: tuple with n-values, corresponds to a row

Dept	Building
Phyis	Block 6
CSE	Block 3

Domain For each attribute of a relation, there is a set of permitted values, called the DOMAIN of attribute.

Roll: alphanumeric string

Roll	Name	DOB	Passport	Dept
A123	Ron	24/11	51-11-11	CSE
A234	Seb	6/4	NULL	EE

Name: Alpha string

DOB: date

Passport: Alphanumeric (Nullable)

Dept: Alpha string

① Attribute values are generally atomic, i.e. indivisible

② Null is a member of domain to indicate the unknown value

Relation (r)

① A_1, A_2, \dots, A_n are attributes

② $R = (A_1, A_2, \dots, A_n)$ is a relation scheme
e.g. faculty (id, name, dept, salary)

③ given domain sets D_1, D_2, \dots, D_n
— a relation r is a subset of $D_1 \times D_2 \times \dots \times D_n$

④ a relⁿ r is a set of n tuples (a_1, a_2, \dots, a_n)
where $a_i \in D_i$

$$r = \{ (a_1, a_2, \dots, a_n) : (a_1, a_2, \dots, a_n) \in (D_1 \times D_2 \times \dots \times D_n) \}$$

- ① current values (relation instance) of r are specified by a table
- ② an element t of r is a tuple, represented by a row in a table.

③ Relations are UNORDERED
— order of tuples is irrelevant
(tuples may be stored in arbitrary order)

Schema diagram
University DB

Section

Classroom

faculty
FIID
Course ID

Student
SID
name
dept-

Course
Course ID
title
dept
credit

Dept-

Key

{ Roll, F-Name, L-Name, DOB, ~~Passport~~ Address, Dept }

S _{No}	¹ Roll	² F-Name	³ L-Name	⁴ DOB	⁵ Passport	⁶ Address	⁷ Dept
1	A001	Ram	Yadav	24/10	J123	1245	CSE
2	A002	Ram	X Y	26/-	<u>NULL</u>	983	ECE
3	A003	Mihir	XY	29/7	K145	7257	CSE
4	A004	Tam	M -	28/6	<u>NULL</u>	5728	EE

A001, Ram, Yadav, 24/10, ~~J123~~ 1245 CSE

{Roll} $\leftarrow 1$

{Roll, FN} $\leftarrow 2$

{Roll, LN} $\leftarrow 2$

{Roll, FN, LN} $\leftarrow 3$

SUPER KEY

multiple superkeys

Candidate Key $\leftarrow 2$

~~{Roll}~~ ✓
{Roll}, ✓
{Address} ✓

Primary Key \rightarrow Roll
Alternate Key \rightarrow Address

