Expt. No. / Name : CHAPTER-3

Date / /

Relational MODEL

The Relational model is today the Primary data Model for Commercial data Processing applications, because of its Simplicity, in the data organisation and the availability of reasonably simple to powerful query languages.

In the Relational model the data items are arranged in tables which indicates the structure, relationship and integrity in the following manner:

1) In any given Column of table, all items are of the same kind.
2) Each item is a simple number or character string.
3) All rows of a table are distinct. In other words, no two rows which are identical in every Column.
4) Ording of rows within a table is doesn't matter.
5) The columns of a table are assigned distinct names and the ordering of these Columns is doesn't matter.
6) If a table has N Columns, it is said to be of degree N.

* A Relational database consists of a collection of tables. Each table is assigned a Unique name.
* A row in a table represents a relationship among a set of values. So that a table is a collection of such relationships.

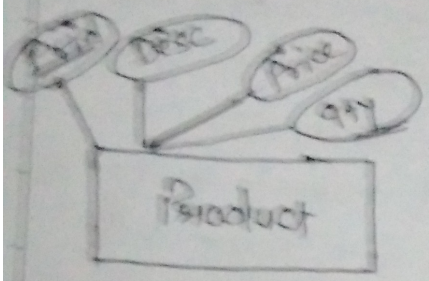
⇒ The Relational Model consists of three basic components:

* A set of domains and a set of relations
* Operation on relations
* Integrity rules.

Teacher's Signature Er. Rakesh Kumar Singh

An Example of a Relational Model

Consider the Product table (relation)



Primary key: Product — Attributes

Pid	Description	Price	Qty.	record
101	CPU	5000	15	1
102	Harddisk.	3000	10	2
103	Monitor	4500	15	3
104	Printer	4000	10	4
105	Pendrive	500	10	5

Tuples

A relation (table) has the following Properties:

* Each column contains values about the same attribute, and each table cell value must be simple (a single value).
* Each column has a distinct name (attribute name), order of columns is immaterial.
* Each row is distinct, that is one row cannot duplicate another row for selected key attribute columns.
* The sequence of the rows is immaterial.

In the given Product relation (Table) a tuple is the collection of values that compose one row of relation. A tuple is equivalent to a record instance. An n-tuple is a tuple composed of n attribute values, where n is called the degree of the relation (table). Product is an example of a 4-tuple. The number of tuples in a relation is its Cardinality.

Consider Product table. It has four column headers: Prid, Description, Price, Qty. In the relational model these headers as attributes.

For each attributes, there is a set of permitted values, called the domain of that attribute. For the attribute Price for example, the domain is the set of all integers values greater than or equal to zero.

In general a table of n attributes must be a subset of-

$$D_1 \times D_2 \times \ldots \times D_{n-1} \times D_n.$$

* Mathematicians define a relation to be a subset of a Cartesian Product of a list of domains.

*⇒ Difference between Relational and Other models:

1. Implementation independance: The relational model logically represents all relationship implicitly.
2. Logical Key Pointers: The relational data model uses Primary (and Secondary) keys in records to represent the association between two records.
3. Normalization Theory: Properties of database that make it free of certain maintenance problems have been developed within the context of the relational model.
4. High level programming languages: Programming languages have been developed specifically to access database defined via the relational data model. These languages permit data to be manipulated as groups of files or procedurally (one record at a time).

Teacher's Signature: Er Rakesh Kumar Singh

Advantages of Relational Approach

i) Ease of use: Any information as tables consisting of rows and columns is quite natural and therefore even first time users find it attractive.

ii) Flexibility: Different tables from which information has to be linked and extracted can be easily manipulated by operators such as project and join to give information in the form in which it is desired.

iii) Precision: The usage of relational algebra and relational calculus in the manipulation of the relations between the tables ensures that there is no ambiguity.

iv) Security: Security control and authorisation can be implemented more easily.

v) Data Independance: Data Independance is achieved more easily with Normalisation structure used in a relational database.

vi) Data Manipulation language: The posibility of responding to adhoc query by means of language based on relational algebra and relational calculus is easy in the relational database approach.

One of the main advantage of the relational model is that it is conceptually simple and more importantly based on mathmatical theory of relation. It also frees the users from details of storage structure and access methods.