Definition of Superkey

A superkey of a relation schema $R = \{A_1, A_2 \ldots A_n\}$ is a set of attributes $S \subseteq R$ with the property that no two tuples t_1 and t_2 in any legal relation state r of R will have $t_1[S] = t_2[S]$.

A Key K is a Superkey with the additional property that removal of any attribute from K will cause K not to be a superkey any more. The difference between a key and a superkey is that a key has to be minimal, that is, if we have a key $K = \{A_1, A_2 \ldots A_k\}$ of R then $K - \{A_i\}$ is not a key of R for any A_i, $1 \leq i \leq k$.

Definition of Prime Attribute

An attribute of relation schema R is called a prime attribute of R if it is a member of some candidate key of R. An attribute is called nonprime if it is not a prime attribute — i.e. if it is not a member of any candidate key.

Eg of Prime attribute

Consider the relations

Employee

Employee

I. | Ename | SSN | Bdate | Address | Dnumber |

Foreign key is Dnumber

Department

II. | DName | Dnumber | Dmgr_SSN |

Prime attribute of Employee is SSN
non-prime attributes are Ename, Bdate, Address and Dnumber.
Dnumber is a foreign key for Employee relations.

III Dept_locations

| Dnumber | Dlocation |

IV. PROJECT

| Pname | Pnumber | Plocation | Dnum |

V. Works_On

| SSN | PNUMBER | HOURS |

Prime attribute for works_on relation is SSN and Pnumber. Non prime attribute is Hours.

Functional Dependencies

A functional dependency is a constraint between two sets of attributes from the database. Suppose that our relational database schema has n attributes $A_1, A_2 \cdots A_n$. Let us think of the whole database as being described by a single universal relation schema

$R = \{A_1, A_2 \cdots A_n\}$

So, a functional dependency, denoted by $X \rightarrow Y$ between two sets of attributes X and Y that are subsets of R specifies a constraint on the possible tuples that can form a relation state r of R. The constraint is that, for any two tuples t_1 and t_2 in r that have

$t_1[X] = t_2[X]$, they must have

$\rightarrow t_1[Y] = t_2[Y]$

This implies that the values of the Y component of a tuple in r depend on, or are determined by, the values of the X component, alternati

the values of the X component of a tuple uniquely determine the value of the Y component.

We also say that there is a functional dependency (FD) on X. So it is shown as

$$X \rightarrow Y$$

X is ~~Right~~ left hand side set of attributes
Y is Right hand side

For e.g.

Voter-ID → Name

Deptt-No → Deptt-Name

Engine-ID → CAR Name, C-Type

also State, Driver-licence-No → Aadhar-NO

Project-Number → Plocation

ENO, PNUMBER → NO-of-Hours

Student, Course → Instructor

Instructor → course

Course-No → offering-Dept, Credit-Hours

Salesperson-NO → Commission-Percentage