SNS COLLEGE OF TECHNOLOGY

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Department of MCA

DBMS – Keys

Course Name : 23CAT603 - DATA BASE MANAGEMENT SYSTEM

Class : I Year / I Semester

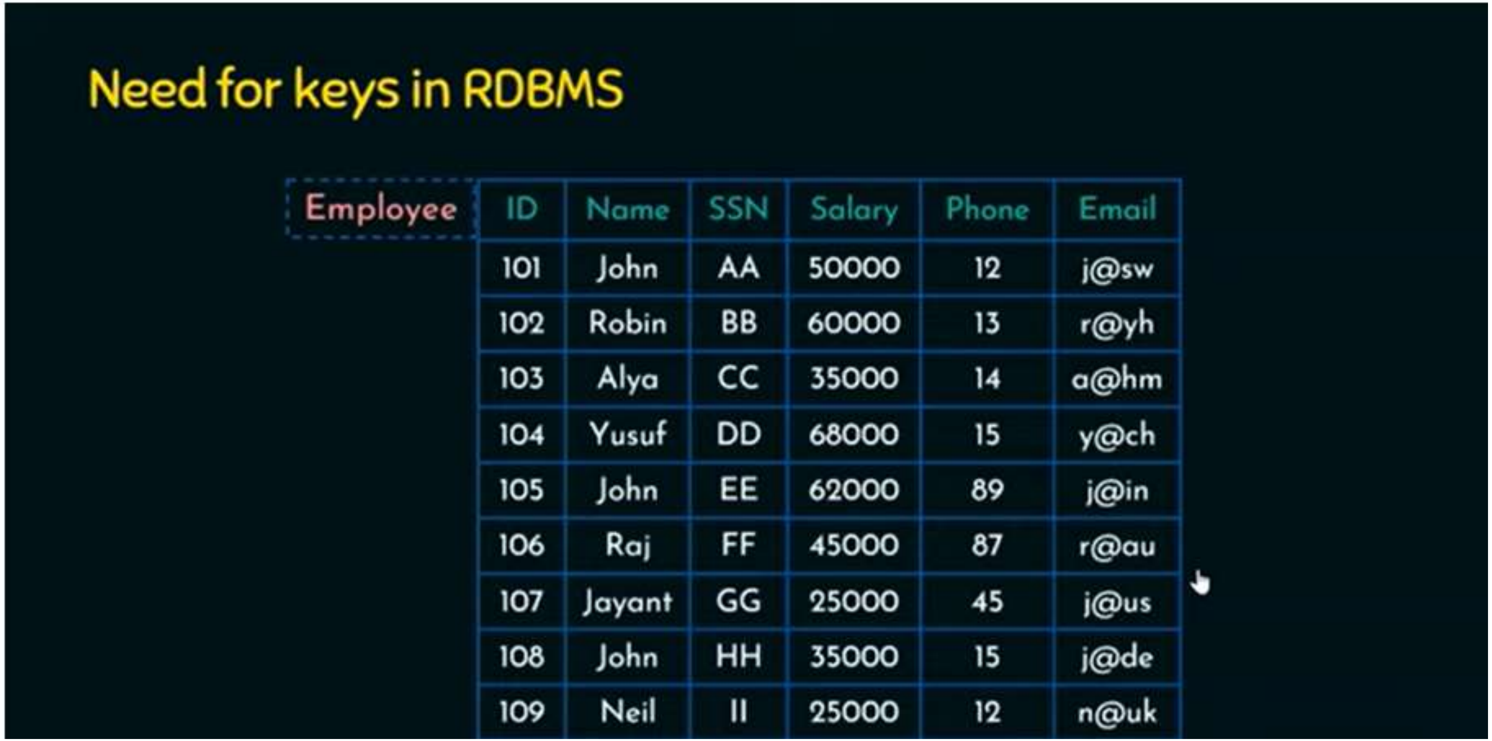
Unit II – Keys

Keys

- **What is Key?**
- **Why do we need key in DBMS?**
- **Types of Keys**

Why do we need keys in DBMS?

- Uniquely to identify tuple in the relation.



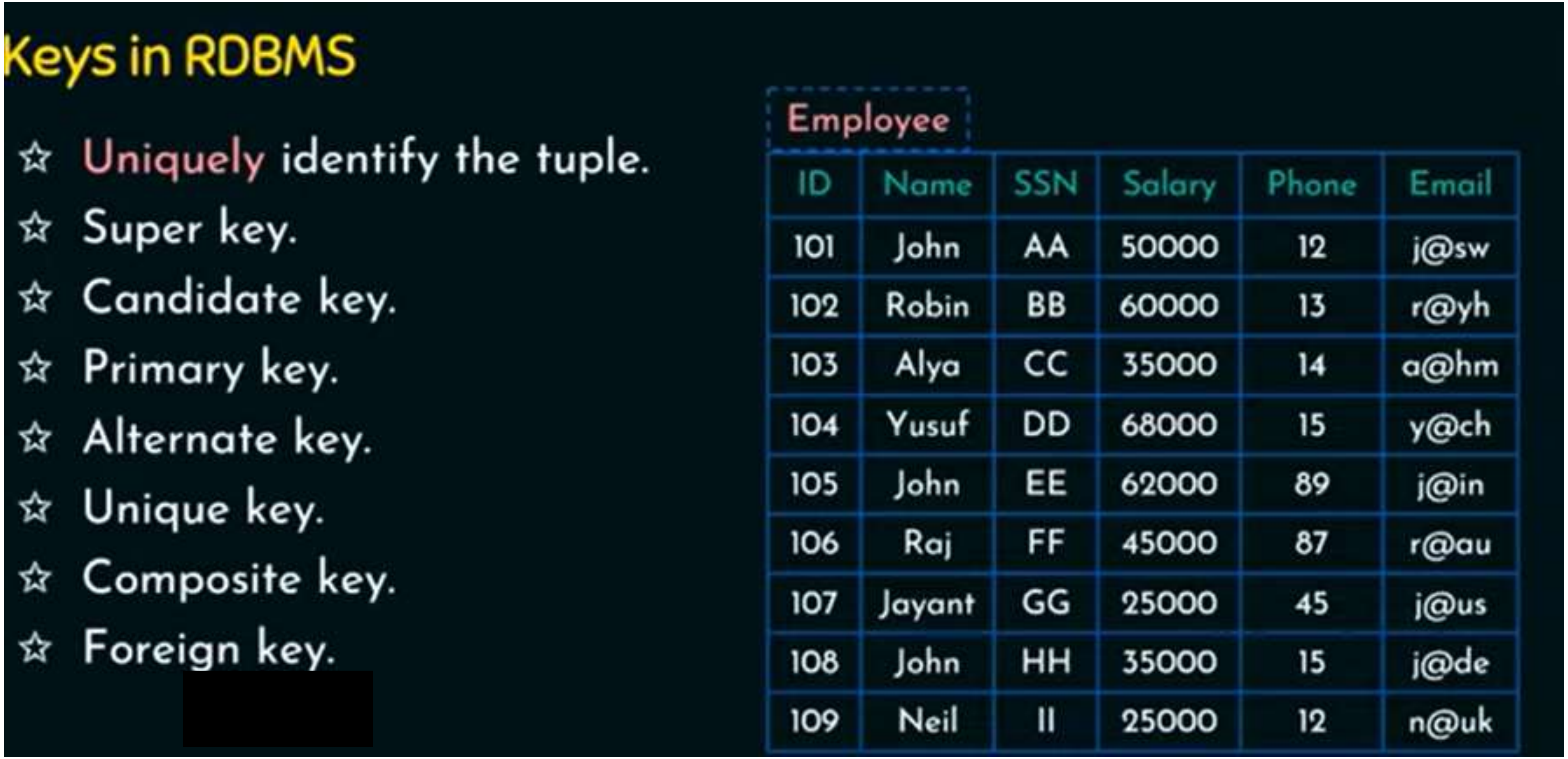
Need for keys in RDBMS

Employee

ID	Name	SSN	Salary	Phone	Email
101	John	AA	50000	12	j@sw
102	Robin	BB	60000	13	r@yh
103	Alya	CC	35000	14	a@hm
104	Yusuf	DD	68000	15	y@ch
105	John	EE	62000	89	j@in
106	Raj	FF	45000	87	r@au
107	Jayant	GG	25000	45	j@us
108	John	HH	35000	15	j@de
109	Neil	II	25000	12	n@uk

Why do we need keys in DBMS?

- Uniquely to identify tuple in the relation.



Keys in RDBMS

- ☆ Uniquely identify the tuple.
- ☆ Super key.
- ☆ Candidate key.
- ☆ Primary key.
- ☆ Alternate key.
- ☆ Unique key.
- ☆ Composite key.
- ☆ Foreign key.

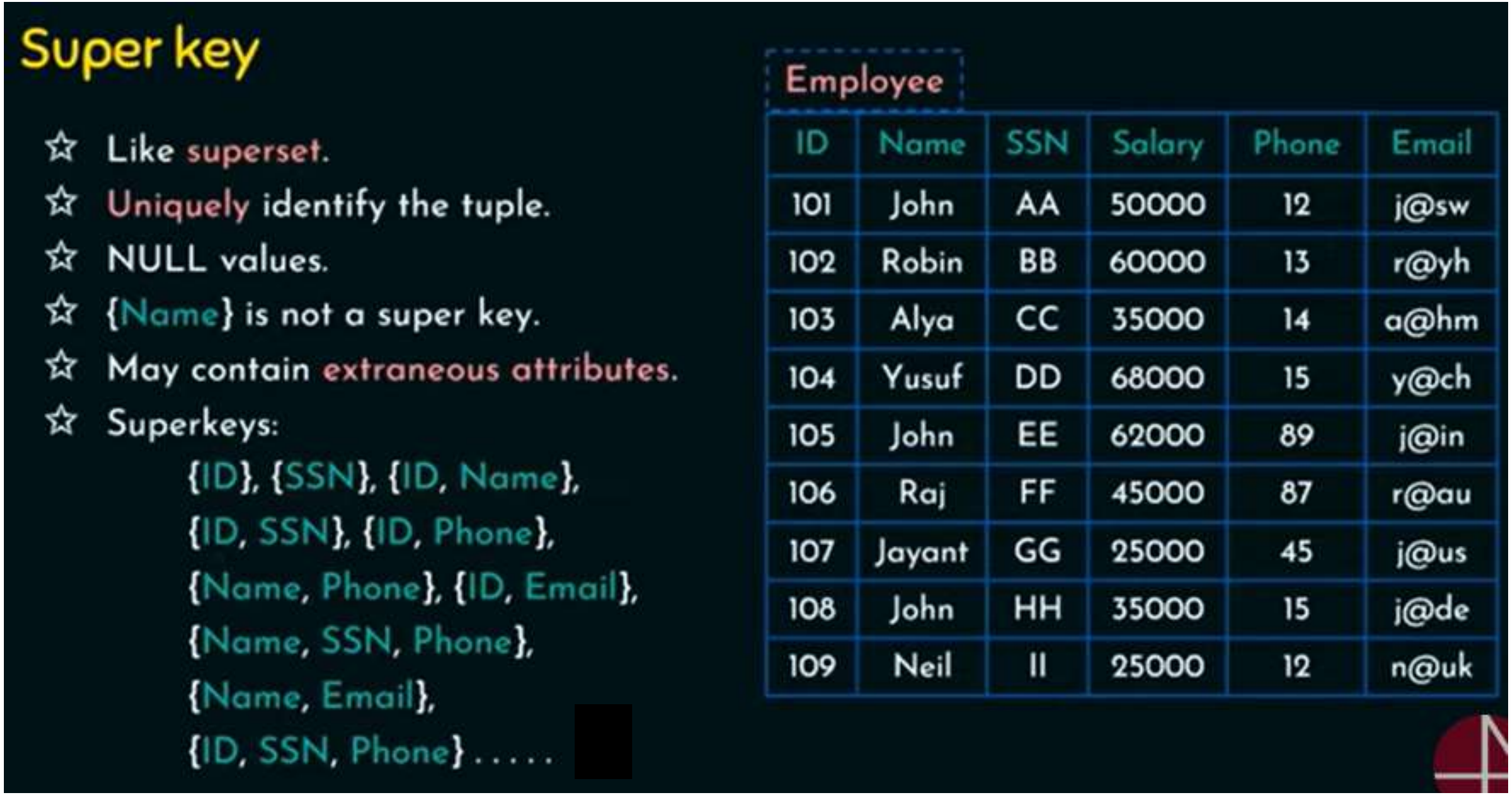
[redacted]

Employee

ID	Name	SSN	Salary	Phone	Email
101	John	AA	50000	12	j@sw
102	Robin	BB	60000	13	r@yh
103	Alya	CC	35000	14	a@hm
104	Yusuf	DD	68000	15	y@ch
105	John	EE	62000	89	j@in
106	Raj	FF	45000	87	r@au
107	Jayant	GG	25000	45	j@us
108	John	HH	35000	15	j@de
109	Neil	II	25000	12	n@uk

Super Key

- Super Key



Super key

☆ Like superset.

☆ Uniquely identify the tuple.

☆ NULL values.

☆ {Name} is not a super key.

☆ May contain extraneous attributes.

☆ Superkeys:

{ID}, {SSN}, {ID, Name},
{ID, SSN}, {ID, Phone},
{Name, Phone}, {ID, Email},
{Name, SSN, Phone},
{Name, Email},
{ID, SSN, Phone} . . . . . [redacted]

Employee

ID	Name	SSN	Salary	Phone	Email
101	John	AA	50000	12	j@sw
102	Robin	BB	60000	13	r@yh
103	Alya	CC	35000	14	a@hm
104	Yusuf	DD	68000	15	y@ch
105	John	EE	62000	89	j@in
106	Raj	FF	45000	87	r@au
107	Jayant	GG	25000	45	j@us
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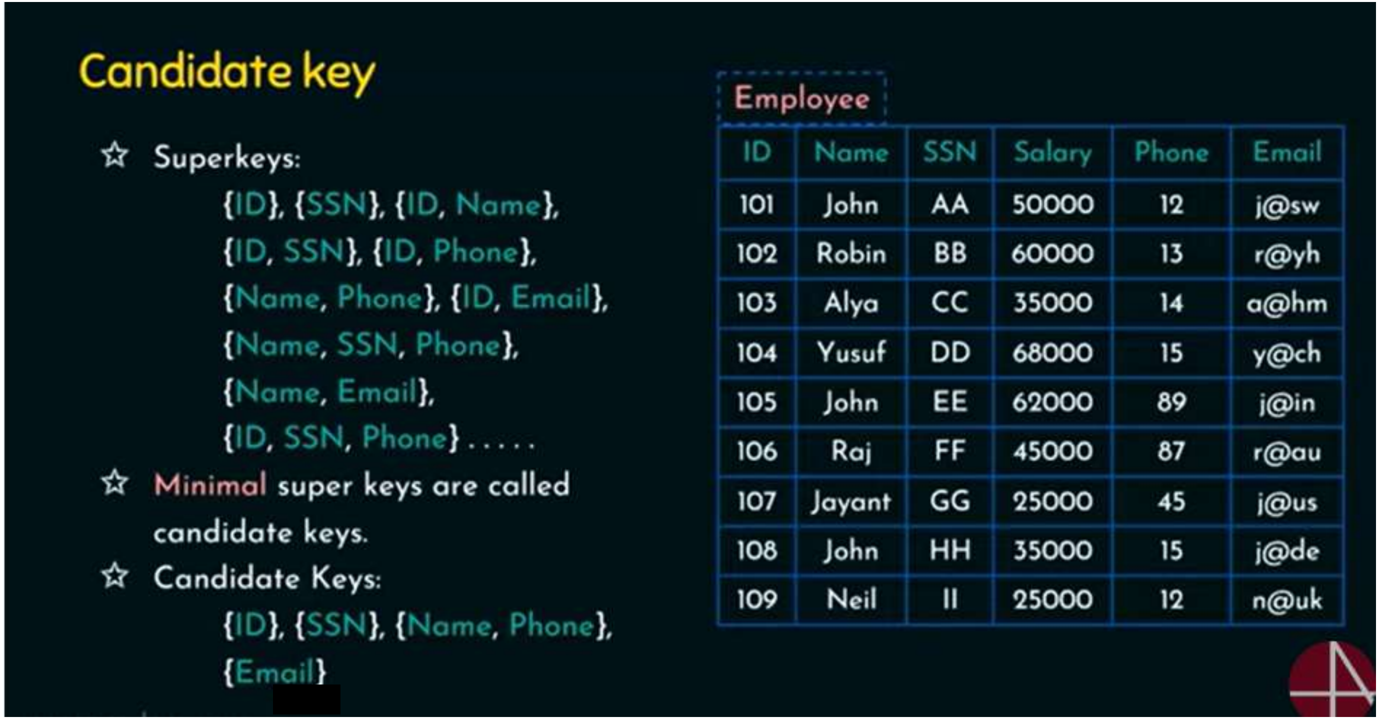
Candidate Key

- Candidate Key



Candidate key

☆ Superkeys:

{ID}, {SSN}, {ID, Name},
{ID, SSN}, {ID, Phone},
{Name, Phone}, {ID, Email},
{Name, SSN, Phone},
{Name, Email},
{ID, SSN, Phone} . . . . .

☆ Minimal super keys are called candidate keys.

☆ Candidate Keys:

{ID}, {SSN}, {Name, Phone},
{Email}

Employee

ID	Name	SSN	Salary	Phone	Email
101	John	AA	50000	12	j@sw
102	Robin	BB	60000	13	r@yh
103	Alya	CC	35000	14	a@hm
104	Yusuf	DD	68000	15	y@ch
105	John	EE	62000	89	j@in
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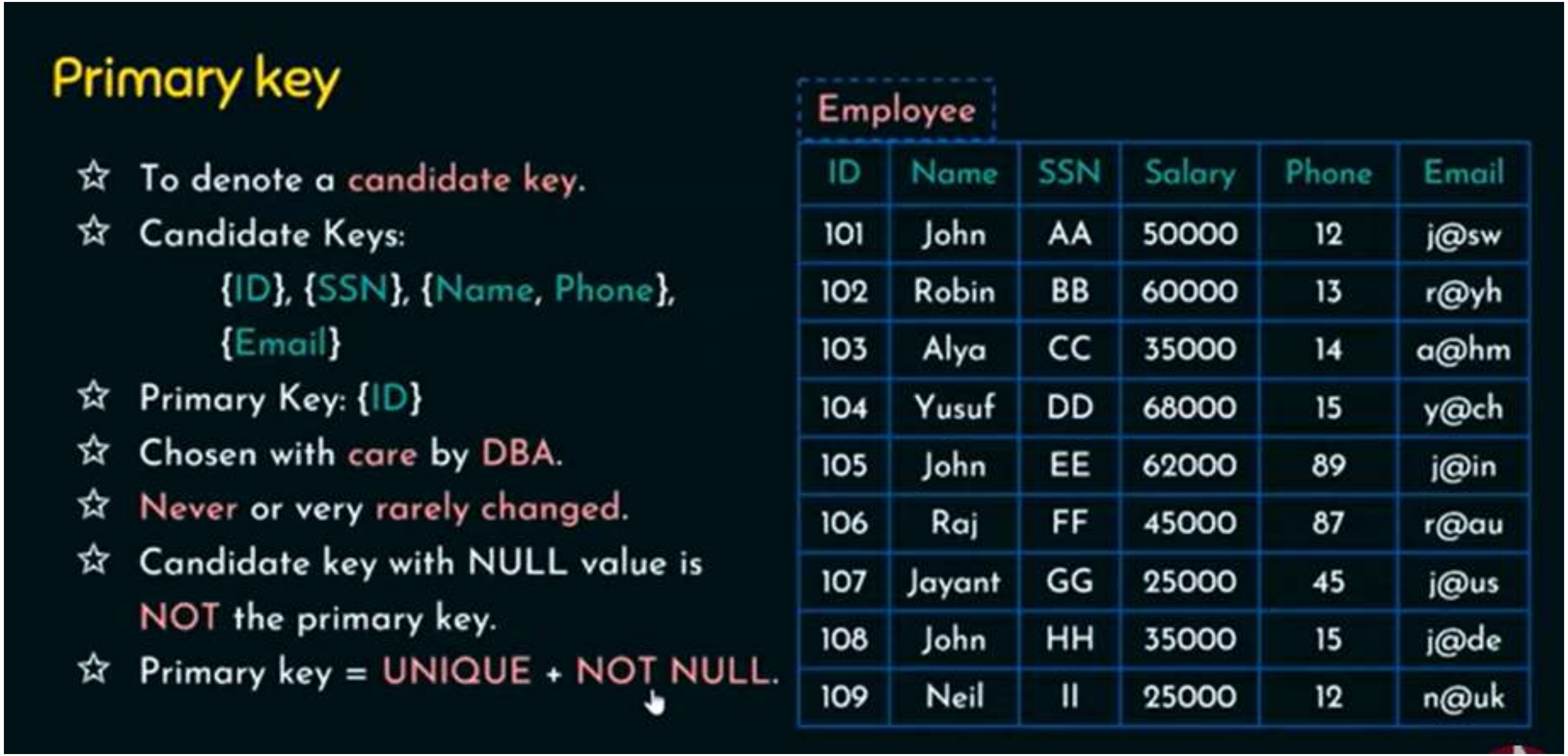
Primary Key

- Primary Key



Primary key

☆ To denote a candidate key.

☆ Candidate Keys:
{ID}, {SSN}, {Name, Phone},
{Email}

☆ Primary Key: {ID}

☆ Chosen with care by DBA.

☆ Never or very rarely changed.

☆ Candidate key with NULL value is NOT the primary key.

☆ Primary key = UNIQUE + NOT NULL.

Employee

ID	Name	SSN	Salary	Phone	Email
101	John	AA	50000	12	j@sw
102	Robin	BB	60000	13	r@yh
103	Alya	CC	35000	14	a@hm
104	Yusuf	DD	68000	15	y@ch
105	John	EE	62000	89	j@in
106	Raj	FF	45000	87	r@au
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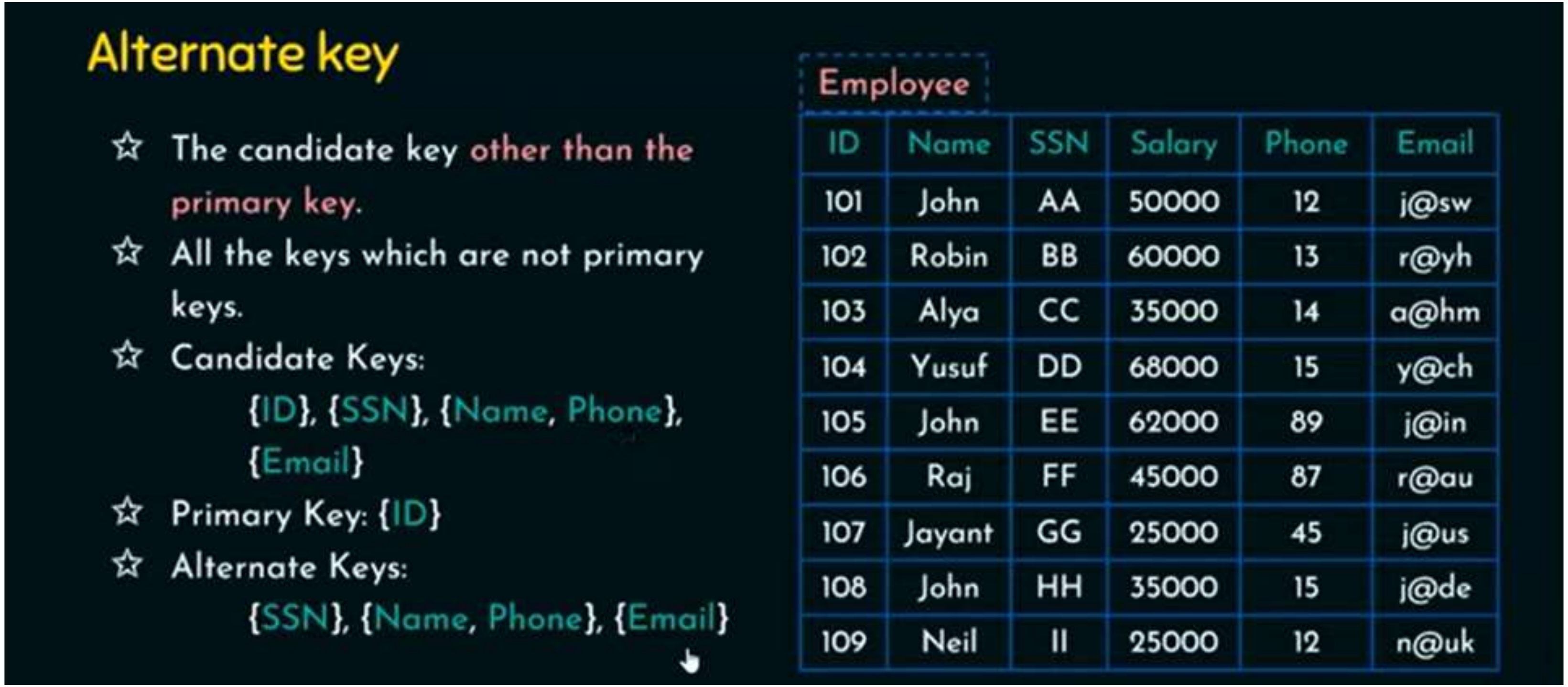
Alternate Key

- Alternate Key



Alternate key

☆ The candidate key other than the primary key.

☆ All the keys which are not primary keys.

☆ Candidate Keys:

{ID}, {SSN}, {Name, Phone}, {Email}

☆ Primary Key: {ID}

☆ Alternate Keys:

{SSN}, {Name, Phone}, {Email}

Employee

ID	Name	SSN	Salary	Phone	Email
101	John	AA	50000	12	j@sw
102	Robin	BB	60000	13	r@yh
103	Alya	CC	35000	14	a@hm
104	Yusuf	DD	68000	15	y@ch
105	John	EE	62000	89	j@in
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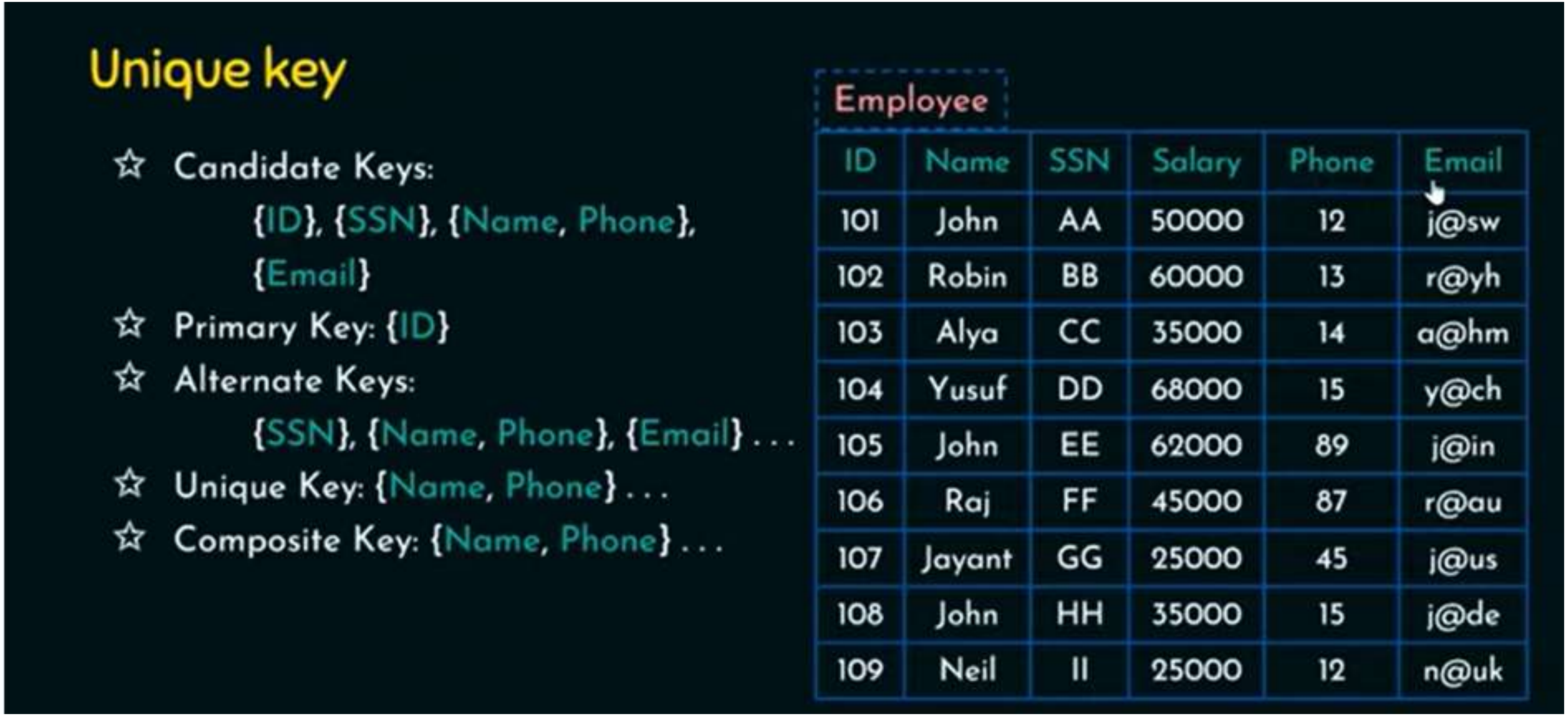
Unique Key

- Unique Key



Unique key

- ☆ Candidate Keys:
  {ID}, {SSN}, {Name, Phone},
  {Email}
- ☆ Primary Key: {ID}
- ☆ Alternate Keys:
  {SSN}, {Name, Phone}, {Email} . . .
- ☆ Unique Key: {Name, Phone} . . .
- ☆ Composite Key: {Name, Phone} . . .

Employee

ID	Name	SSN	Salary	Phone	Email
101	John	AA	50000	12	j@sw
102	Robin	BB	60000	13	r@yh
103	Alya	CC	35000	14	a@hm
104	Yusuf	DD	68000	15	y@ch
105	John	EE	62000	89	j@in
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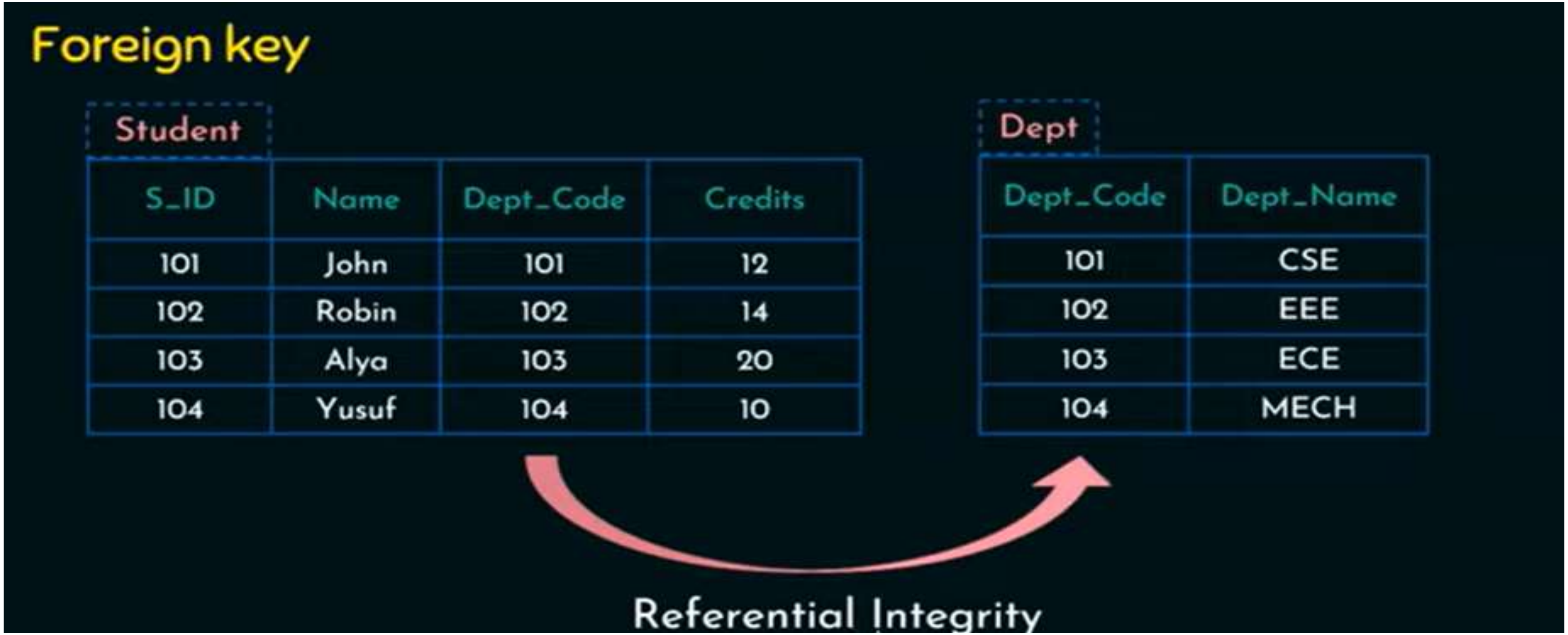
Referential Integrity

- Referential Integrity



Foreign key

Student

S_ID	Name	Dept_Code	Credits
101	John	101	12
102	Robin	102	14
103	Alya	103	20
104	Yusuf	104	10

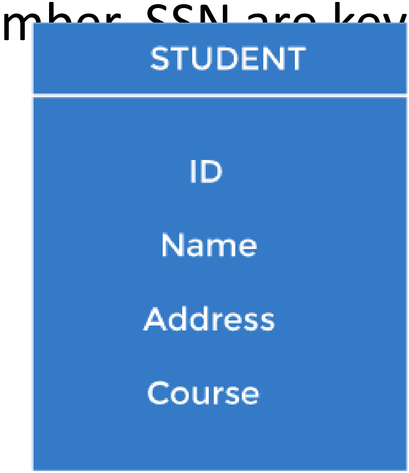
Dept

Dept_Code	Dept_Name
101	CSE
102	EEE
103	ECE
104	MECH

Referential Integrity

Keys

- It is used to uniquely identify any record or row of data from the table. It is also used to establish and identify relationships between tables.
- **For example,** ID is used as a key in the Student table because it is unique for each student. In the PERSON table, passport_number, license_number, SSN are keys since they are unique for each person.



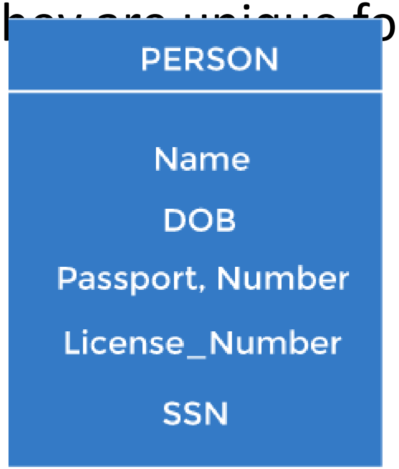
STUDENT

ID

Name

Address

Course



PERSON

Name

DOB

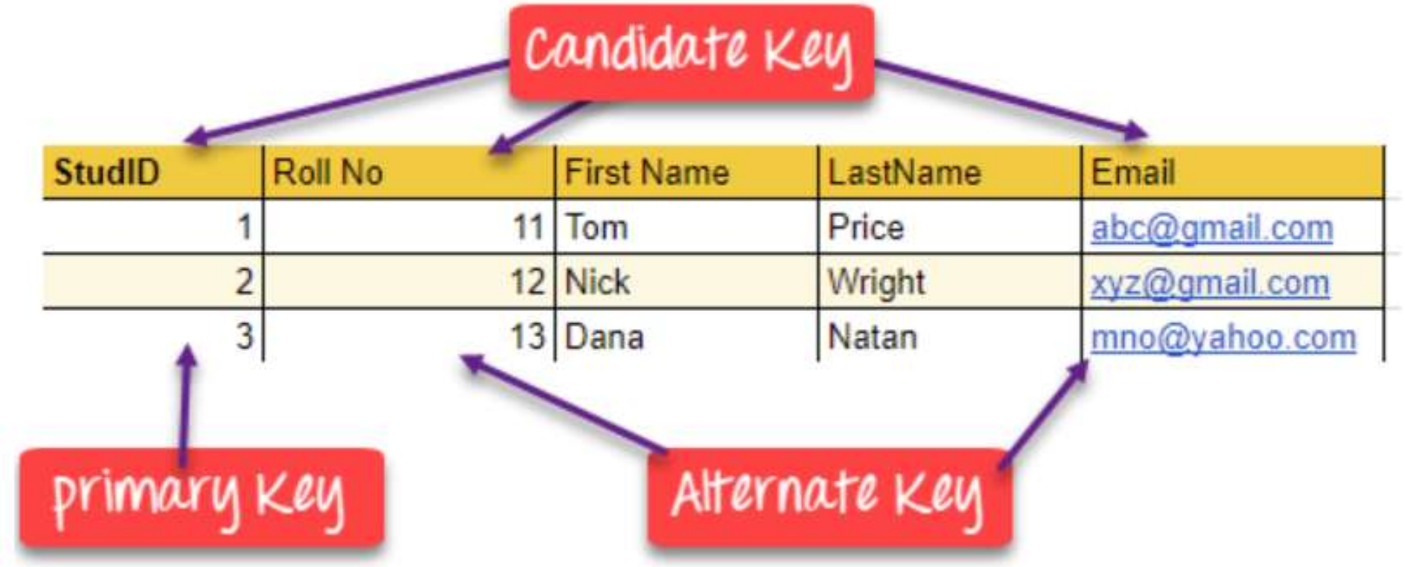
Passport, Number

License_Number

SSN

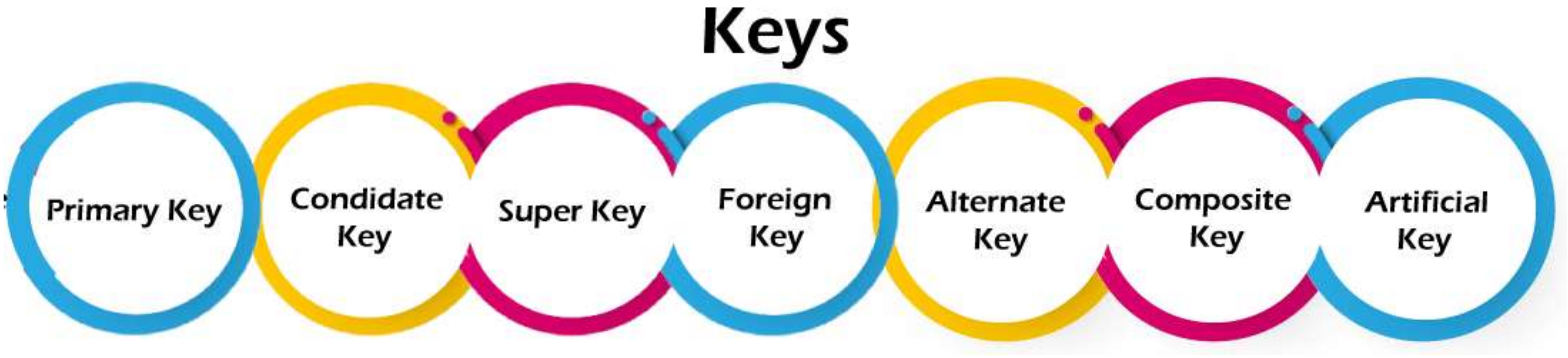
Relational Model concept

- **Relational key:** In the relational key, each row has one or more attributes. It can identify the row in the relation uniquely.



StudID	Roll No	First Name	LastName	Email
1	11	Tom	Price	abc@gmail.com
2	12	Nick	Wright	xyz@gmail.com
3	13	Dana	Natan	mno@yahoo.com

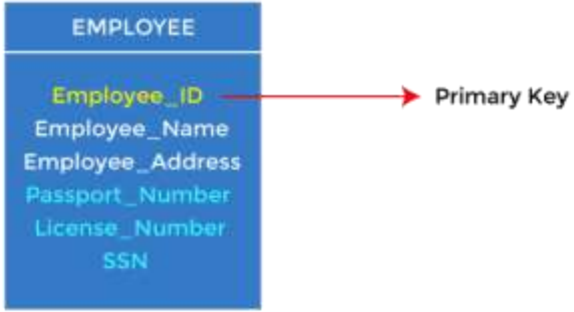
Types of keys



Primary Key

1. Primary key

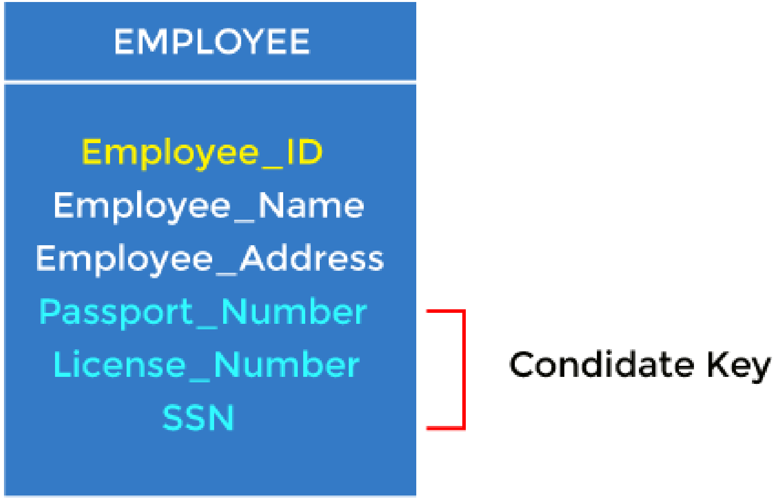
- It is the first key used to identify one and only one instance of an entity uniquely. An entity can contain multiple keys, as we saw in the PERSON table. The key which is most suitable from those lists becomes a primary key.
- In the EMPLOYEE table, ID can be the primary key since it is unique for each employee. In the EMPLOYEE table, we can even select License_Number and Passport_Number as primary keys since they are also unique.
- For each entity, the primary key selection is based on requirements and developers.



Candidate key

2. Candidate key

- A candidate key is an attribute or set of attributes that can uniquely identify a tuple.
- Except for the primary key, the remaining attributes are considered a candidate key. The candidate keys are as strong as the primary key.
- For example: In the EMPLOYEE table, id is best suited for the primary key. The rest of the attributes, like SSN, Passport_Number, License_Number, etc., are considered a candidate key.



EMPLOYEE

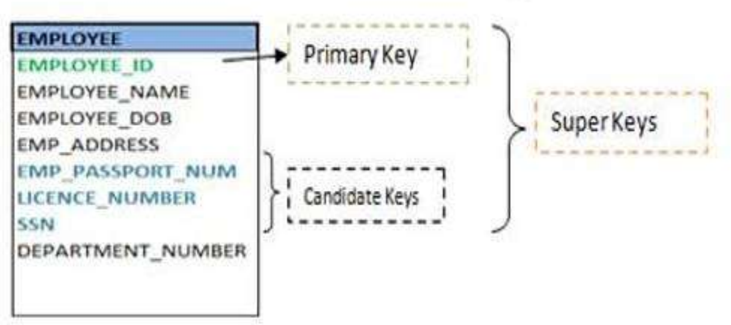
Employee_ID
Employee_Name
Employee_Address
Passport_Number
License_Number
SSN

Condidate Key

Super Key

3. Super Key

Super key is an attribute set that can uniquely identify a tuple. A super key is a superset of a candidate key.

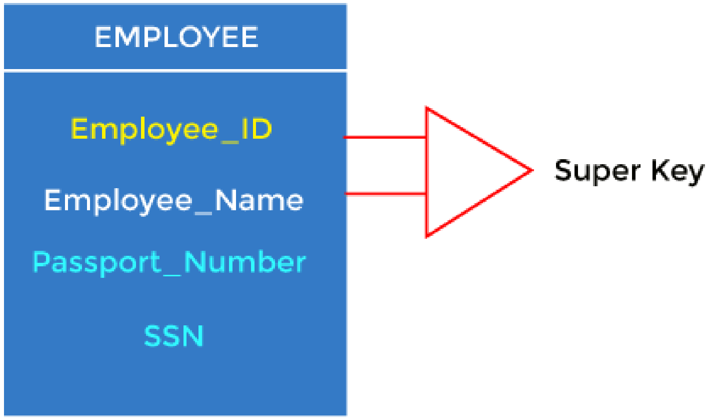


EMPLOYEE
EMPLOYEE_ID
EMPLOYEE_NAME
EMPLOYEE_DOB
EMP_ADDRESS
EMP_PASSPORT_NUM
LICENCE_NUMBER
SSN
DEPARTMENT_NUMBER

Primary Key

Candidate Keys

Super Keys



EMPLOYEE
Employee_ID
Employee_Name
Passport_Number
SSN

Super Key

For example: In the above EMPLOYEE table, for(EMPLOEE_ID, EMPLOYEE_NAME), the name of two employees can be the same, but their EMPLYEE_ID can't be the same. Hence, this combination can also be a key.

The super key would be EMPLOYEE-ID (EMPLOYEE_ID, EMPLOYEE-NAME), etc.

Foreign key

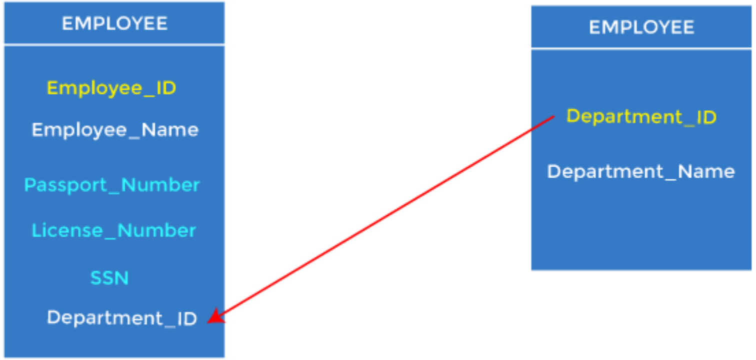
4. Foreign key

Foreign keys are the column of the table used to point to the primary key of another table.

Every employee works in a specific department in a company, and employee and department are two different entities. So we can't store the department's information in the employee table. That's why we link these two tables through the primary key of one table.

We add the primary key of the DEPARTMENT table, Department_Id, as a new attribute in the EMPLOYEE table.

In the EMPLOYEE table, Department_Id is the foreign key, and both the tables are related.

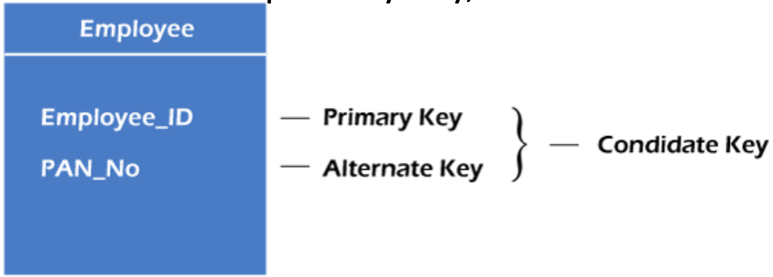


Alternate key

5. Alternate key

•There may be one or more attributes or a combination of attributes that uniquely identify each tuple in a relation. These attributes or combinations of the attributes are called the candidate keys. One key is chosen as the primary key from these candidate keys, and the remaining candidate key, if it exists, is termed the alternate key. In other words, the total number of the alternate keys is the total number of candidate keys minus the primary key. The alternate key may or may not exist. If there is only one candidate key in a relation, it does not have an alternate key.

•For example, employee relation has two attributes, Employee_Id and PAN_No, that act as candidate keys. In this relation, Employee_Id is chosen as the primary key, so the other candidate key, PAN_No, acts as the Alternate key.

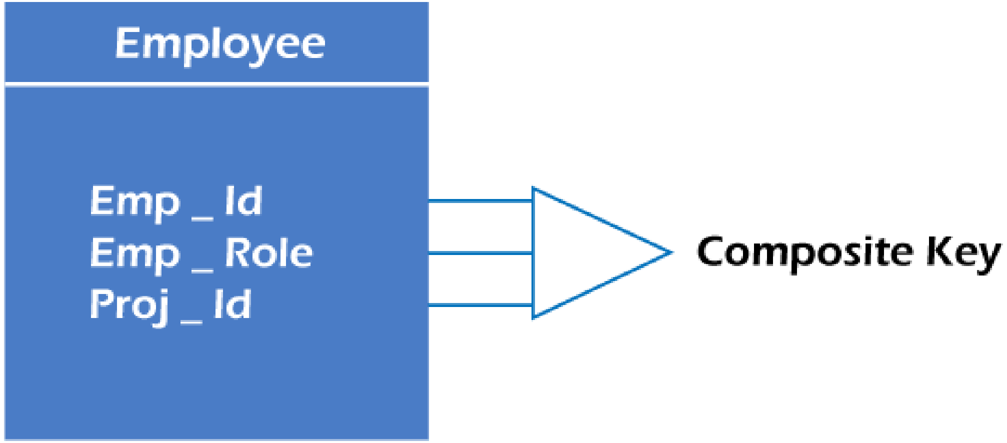


Composite key

6. Composite key

Whenever a primary key consists of more than one attribute, it is known as a composite key. This key is also known as Concatenated Key.

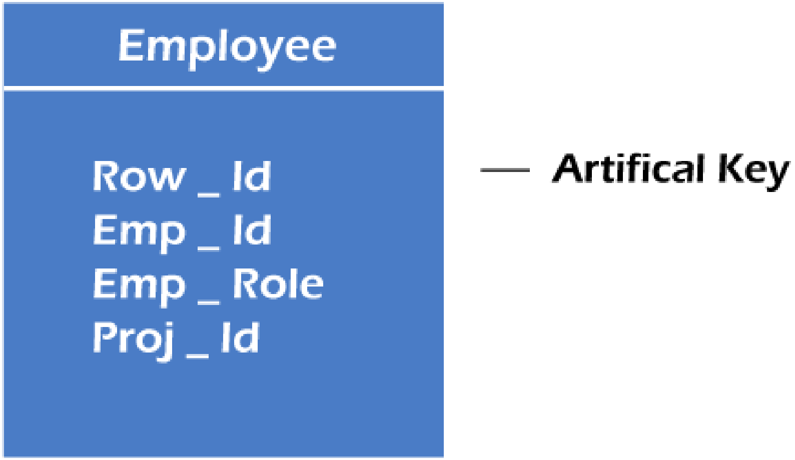
For example, in employee relations, we assume that an employee may be assigned multiple roles, and an employee may work on multiple projects simultaneously. So the primary key will be composed of all three attributes, namely Emp_ID, Emp_role, and Proj_ID in combination. So these attributes act as a composite key since the primary key comprises more than one attribute.



Composite key

7. Artificial key

- The key created using arbitrarily assigned data are known as artificial keys. These keys are created when a primary key is large and complex and has no relationship with many other relations. The data values of the artificial keys are usually numbered in a serial order.
- For example, the primary key, which is composed of Emp_ID, Emp_role, and Proj_ID, is large in employee relations. So it would be better to add a new virtual attribute to identify each tuple in the relation uniquely.

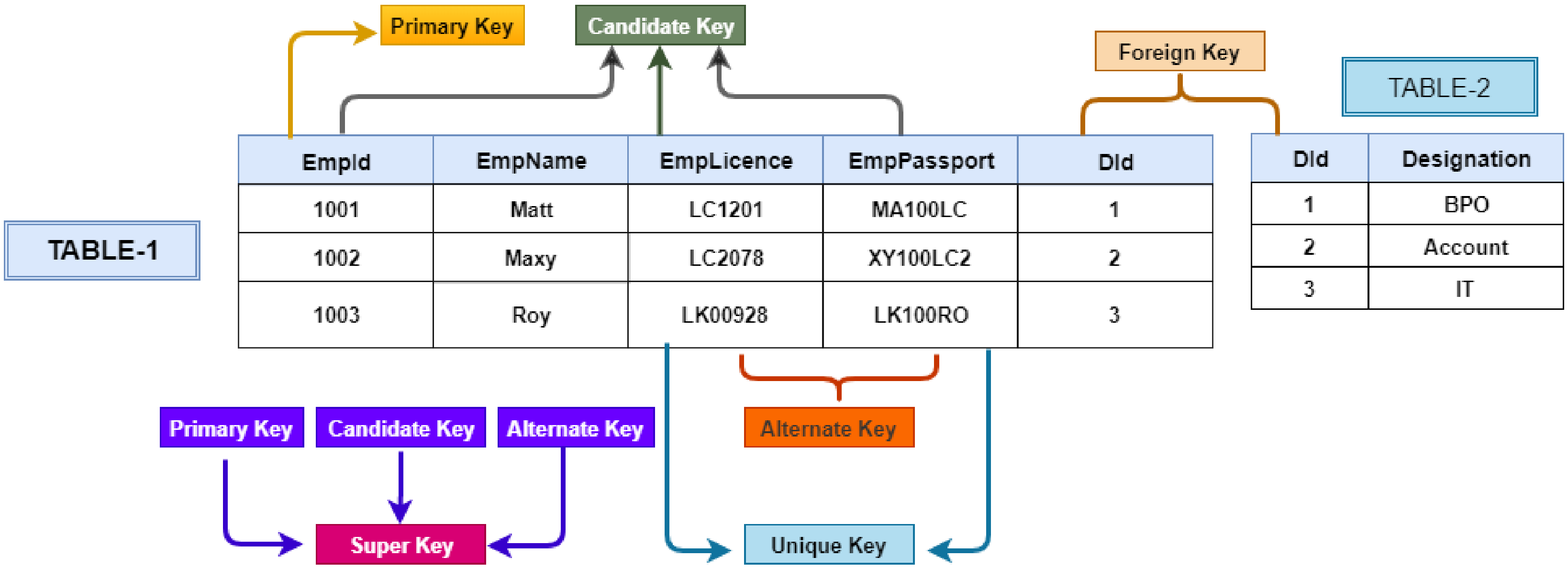


Employee

Row _ Id
Emp _ Id
Emp _ Role
Proj _ Id

— Artifical Key

Types of keys



Primary Key

Candidate Key

Foreign Key

TABLE-1

EmpId	EmpName	EmpLicence	EmpPassport	DId
1001	Matt	LC1201	MA100LC	1
1002	Maxy	LC2078	XY100LC2	2
1003	Roy	LK00928	LK100RO	3

TABLE-2

DId	Designation
1	BPO
2	Account
3	IT

Primary Key

Candidate Key

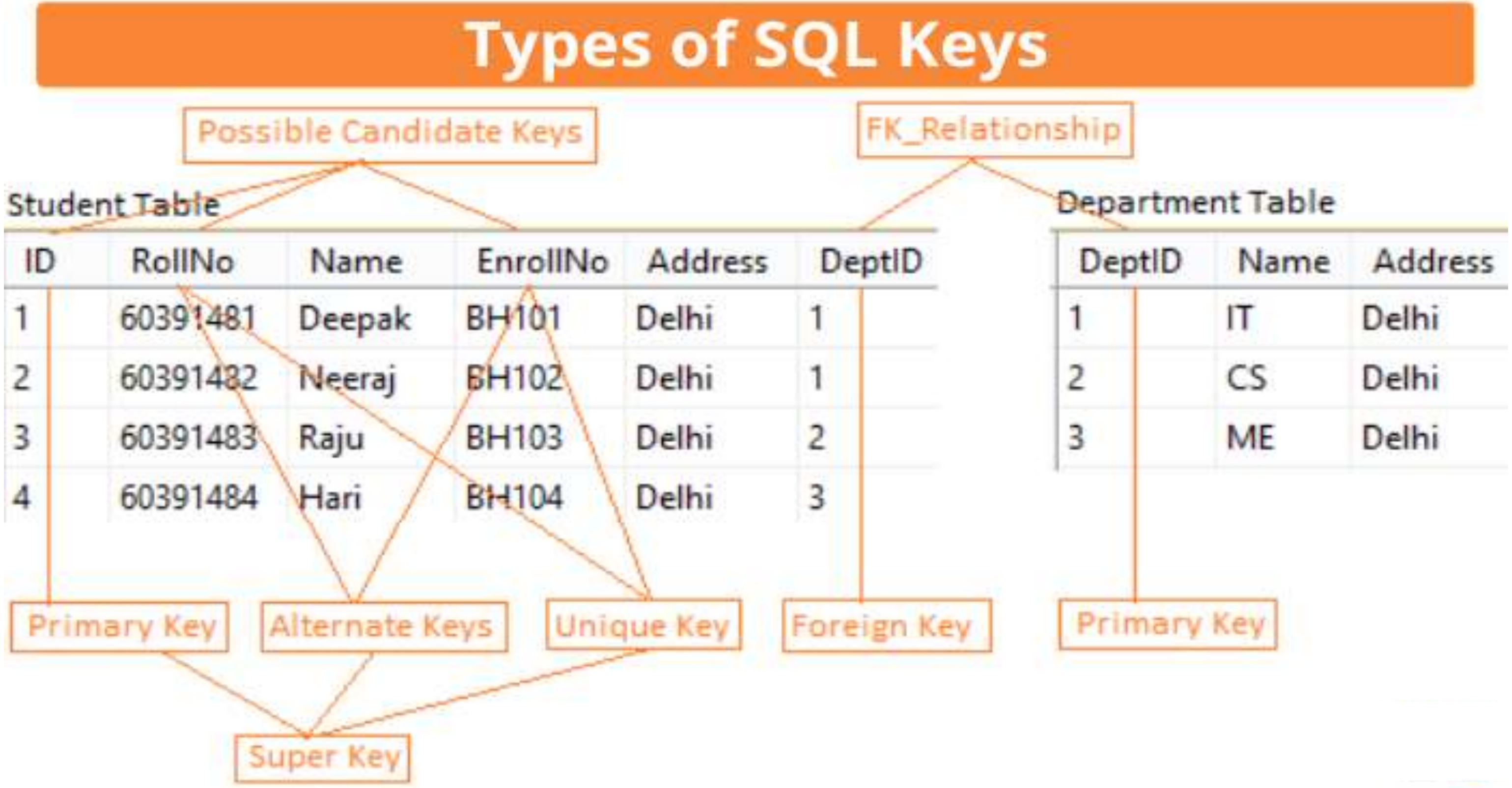
Alternate Key

Super Key

Alternate Key

Unique Key

Types of keys



Types of SQL Keys

Student Table

ID	RollNo	Name	EnrollNo	Address	DeptID
1	60391481	Deepak	BH101	Delhi	1
2	60391482	Neeraj	BH102	Delhi	1
3	60391483	Raju	BH103	Delhi	2
4	60391484	Hari	BH104	Delhi	3

Department Table

DeptID	Name	Address
1	IT	Delhi
2	CS	Delhi
3	ME	Delhi

Types of keys

Set of all Superkeys

{ Emp_Id }

{ Emp_Email }

{ Emp_Id , Emp_Name }

{ Emp_Id , Emp_Email }

{ Emp_Id, Emp_Department }

{Emp_Email, Emp_Name}

{ Emp_Email, Emp_Department }

{Emp_Id, Emp_Name, Emp_Email }

{Emp_Id, Emp_Name, Emp_Department }

{ Emp_Name,Emp_Email,Emp_Department }

Types of keys

Super Key – A super key is a group of single or multiple keys which identifies rows in a table.

Primary Key – is a column or group of columns in a table that uniquely identify every row in that table.

Candidate Key – is a set of attributes that uniquely identify tuples in a table. Candidate Key is a super key with no repeated attributes.

Alternate Key – is a column or group of columns in a table that uniquely identify every row in that table.

Foreign Key – is a column that creates a relationship between two tables. The purpose of Foreign keys is to maintain data integrity and allow navigation between two different instances of an entity.

Compound Key – has two or more attributes that allow you to uniquely recog

nize a specific record. It is possible that each column may not be unique by itself within the database.

Composite Key – is a combination of two or more columns that uniquely identify rows in a table. The combination of columns guarantees uniqueness, though individual uniqueness is not guaranteed.

Surrogate Key – An artificial key which aims to uniquely identify each record is called a surrogate key. These kind of key are unique because they are created when you don’t have any natural primary key.

Relational Model concept

Properties of Relations

- Name of the relation is distinct from all other relations.
- Each relation cell contains exactly one atomic (single) value
- Each attribute contains a distinct name
- Attribute domain has no significance
- tuple has no duplicate value
- Order of tuple can have a different sequence

References

1. https://www.javatpoint.com/dbms-data-model-schema-and-instance

2. https://hirinfotech.com/structured-vs-unstructured-data/