COMPUTER SCIENCE
12

(MS Access and C)

CHAPTER 2: Basic Concepts and Terminology of Databases

Topics

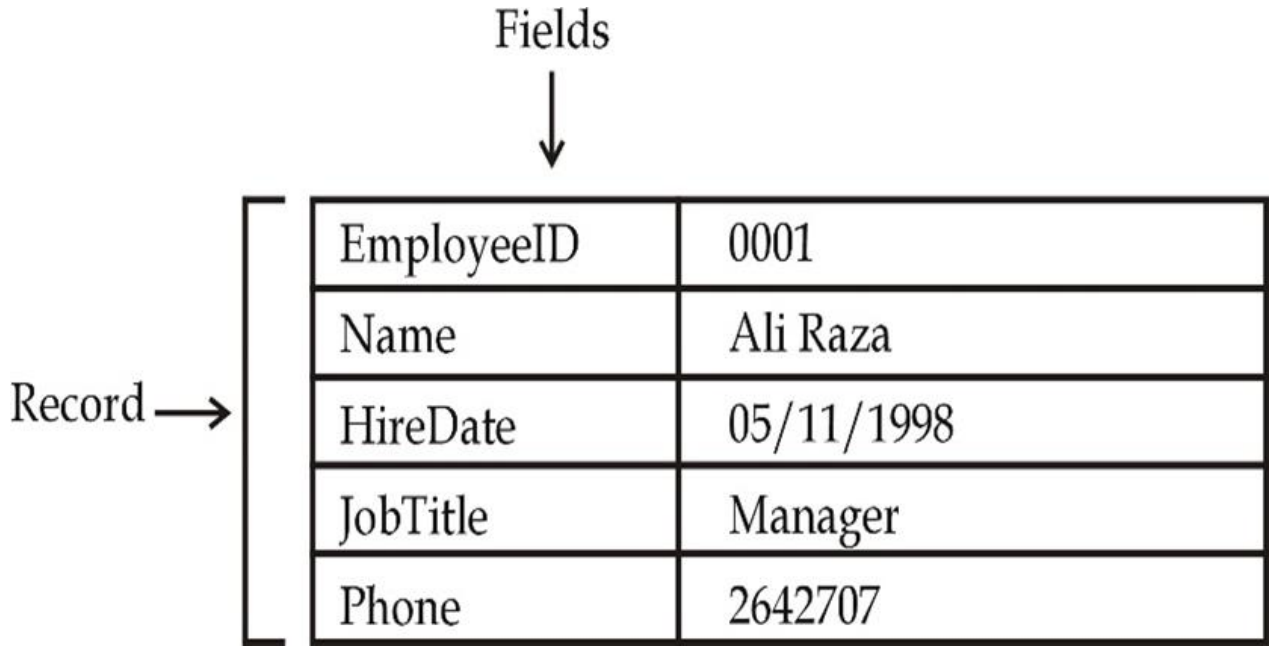
- Construction of Records & Files
- Fixed & Variable length Field
- Data Handling
- Table Formation
- Properties of relation
- View
- Keys and its types
- Usage of Index in FMS & DBMS
- Role of Database User
- Responsibilities of DBA
- Data Manipulation in DBMS

Construction of Records & Files

File management system uses fields, records & files to organize data

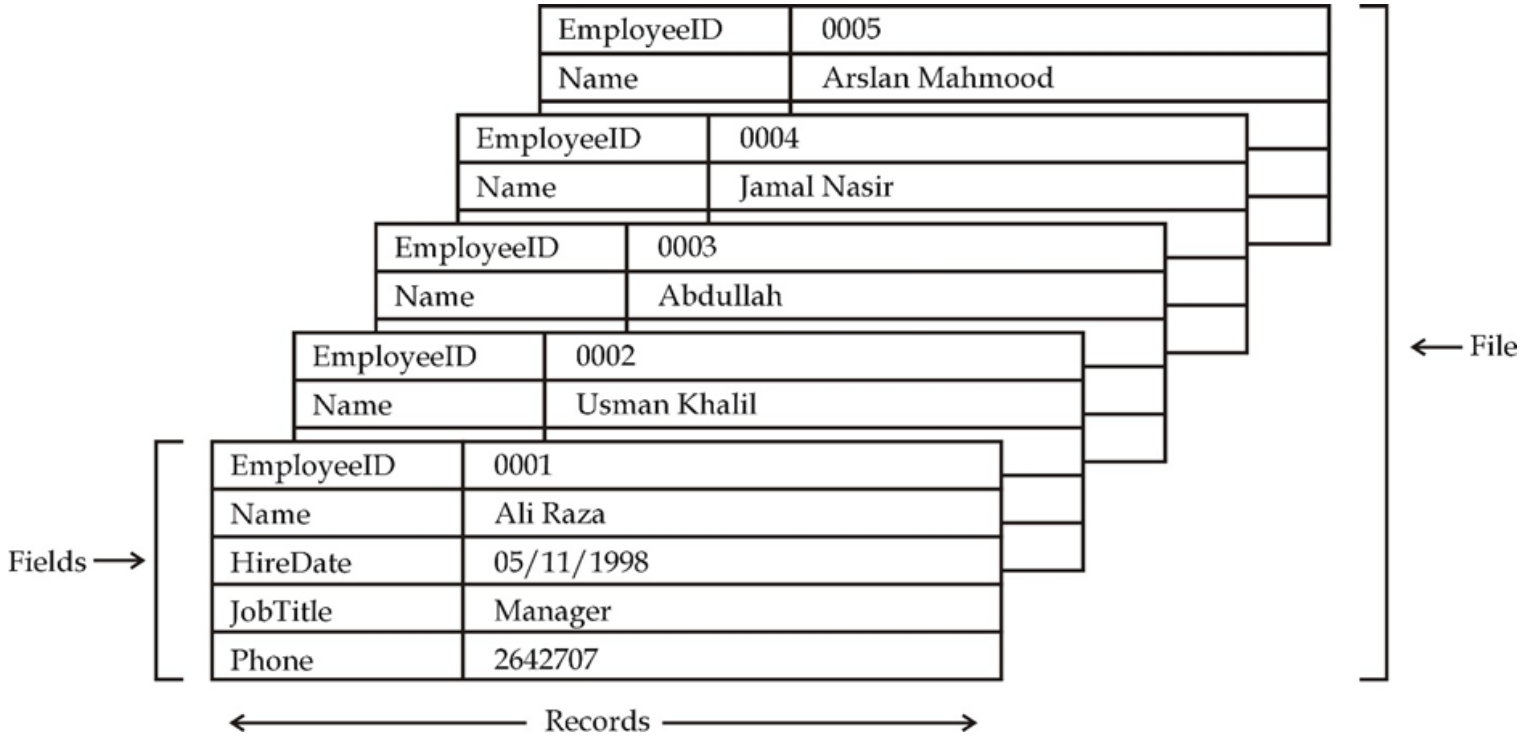
Field:- A combination of one or more characteristics

Record:- A Collection of related fields used as a single unit



Construction of Records & Files(Cont.)

File:- A collection of related records used as a single unit



Fixed & Variable length Field

Fixed Length Field

- It contains predefined number of characters (Bytes)
- Data entered in fixed-length field cannot exceed allocated length of the field
- If the data entered in fixed-length field is smaller than length, the remaining space will be empty
- Wastage of storage space

Example:- Suppose a country field is specific fixed length field 20 characters

Variable Length Field

- It does not contain predefined number of characters (Bytes)
- Occupies the space according to the data entered by the user

Example: Suppose user enter “PAKISTAN” in country field. It will occupy only eight characters

Data Handling

- File management System uses files to store and retrieve data
- Files contains records of related fields
- A field in the record can be fixed length or variable length
- Each field is the record corresponds to a starting memory address
- The starting memory address of each field and it length is used to identify its storage location
- Field name is used as a name reference to store and retrieve data

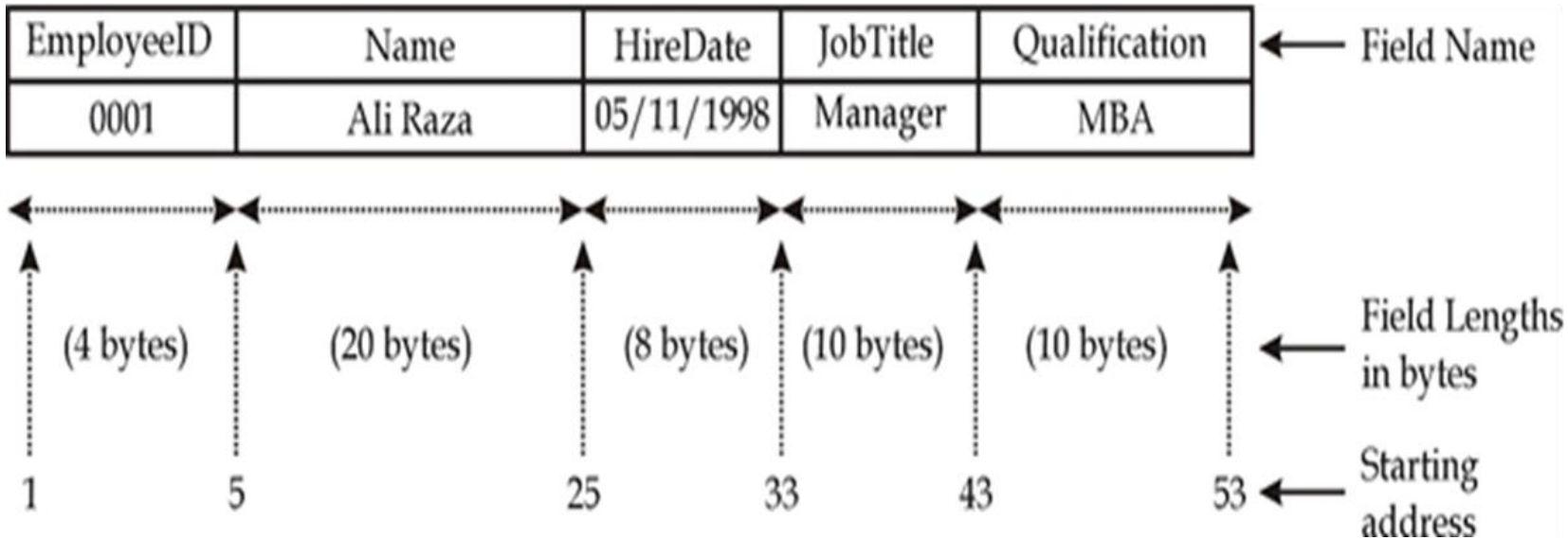


Table / Relation Formation

- A table or relation is used to store information about an entity
- An entity is anything about which information is stored in the database
- An entity may have many attributes with unique name
- Each attribute must have one and only one value
- **Example:-** STUDENT(Roll No, Name, DOB, Address, Phone)

Entity

Attributes

- Entities that the organization wants to store data about typically becomes a database table or relation

Columns

Rows / Tuples

RollNo	Name	DOB	Address	Phone
1	Ali Raza	05/11/1998	21 Mall Road, Lahore	1234567
2	Asif Naeem	01/01/2000	42 Jail Road, Lahore	2642707
3	Hamza Riaz	02/03/2001	12 Tufail Road, Lahore	7234207

Forming a Relation(STUDENT with three records)

Properties of relation

- ✓ A relation or table is the basics of relational database management system.
- ✓ RELATIONAL MODEL (RM) represents the database as a collection of relations.
- ✓ A Relation has the following properties:

Properties of Relation

1- No Duplicate Rows/Tuples Exits

Each tuple in a relation must be unique

It ensures that every tuple or row in relation is identified using the primary key

It must have one column or set of columns to uniquely identify each row or tuple in the relation

Roll No	Name	DOB	City
1	Asghar	12-10-01	Lahore
2	Akram	13-11-01	Lahore
3	Nasir	15-08-01	Karachi
4	Hassaan	11-11-11	Karachi
5	Ahmad	01-01-01	Islamabad

Properties of Relation

2- Insignificant Tuple/Row Sequence

The sequence or position of tuples in a relation is also insignificant

The sequence may be changed

The rows can be retrieved in any order

A new tuple may be inserted at the beginning, at the end or in the middle of the relation

Roll No	Name	DOB	City
1	Asghar	12-10-01	Lahore
2	Akram	13-11-01	Lahore
3	Nasir	15-08-01	Karachi
4	Hassaan	11-11-11	Karachi
5	Ahmad	01-01-01	Islamabad

Properties of Relation

3- Insignificant Attribute/Column Sequence

The sequence of attributes in a relation is insignificant

This sequence can be changed without changing the meaning or use of the relation

The columns can be retrieved in any order

The benefit of this property is that it enables many users to share the same table without concern of how the table is organized

Roll No	Name	DOB	City
1	Asghar	12-10-01	Lahore
2	Akram	13-11-01	Lahore
3	Nasir	15-08-01	Karachi
4	Hassaan	11-11-11	Karachi
5	Ahmad	01-01-01	Islamabad

Properties of Relation

4- Atomic Values in Columns/Attributes

An entry at the intersection of each row and column is atomic

Value that cannot be divided further is called atomic value

There can be only one valued in each attribute of a specific row or tuple

Roll No	Name	DOB	City
1	Asghar	12-10-01	Lahore
2	Akram	13-11-01	Lahore
3	Nasir	15-08-01	Karachi
4	Hassaan	11-11-11	Karachi
5	Ahmad	01-01-01	Islamabad

View

- A view is virtual table that displays the data from one or more tables
- Same data of database can be viewed in different ways
- It is created by using SQL query

Purpose

- keep data safe and secure from unauthorized and illegal use
- It displays data according to user requirements

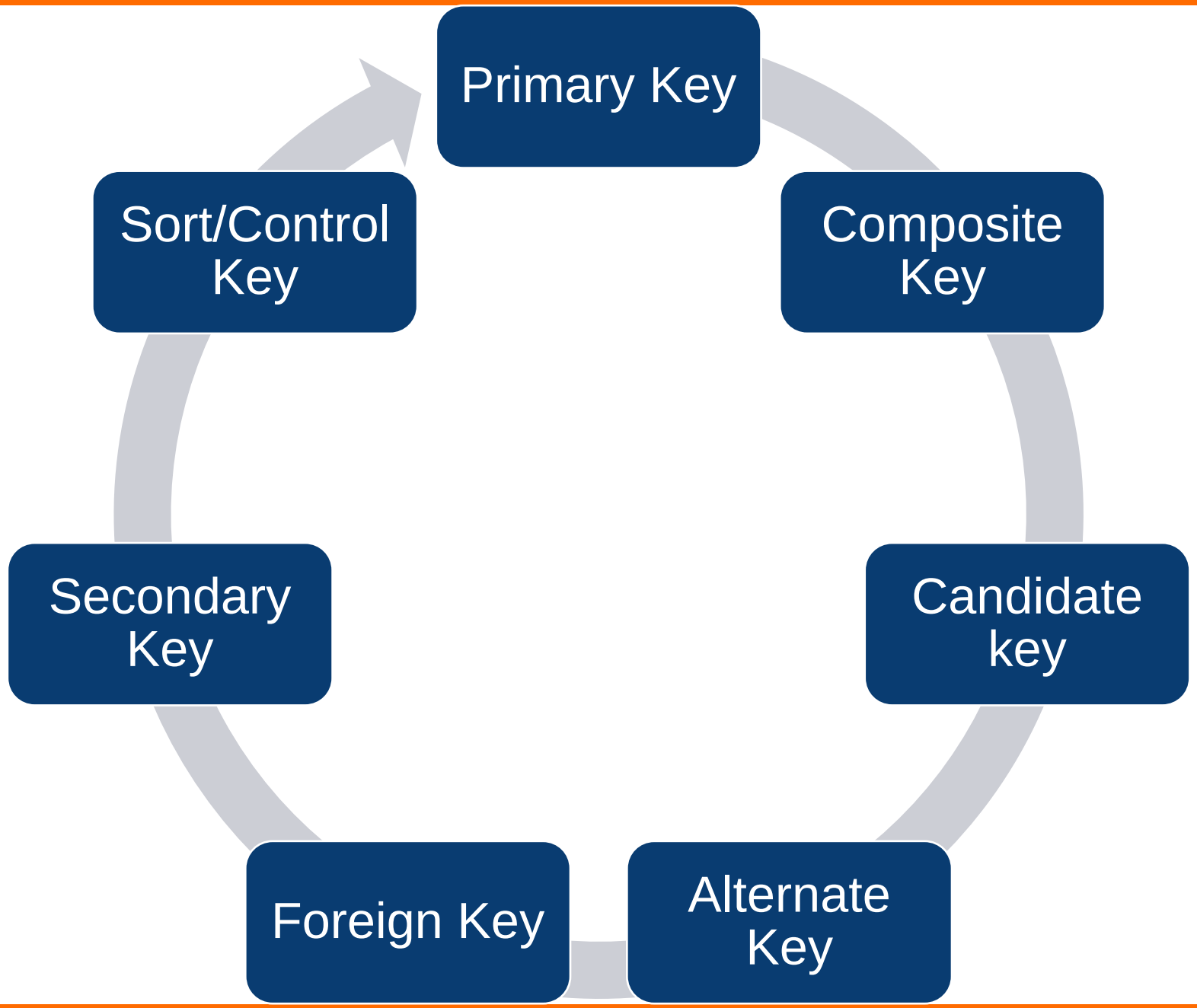
Creating Views

```
CREAT VIEW   STUDENT_VIEW AS
SELECT       ROLLNO, NAME
FROM         STUDENT
WHERE        GENDER = "M";
```

KEYS

- ✓Attribute or set of attributes that uniquely identifies a tuple in relation
- ✓ Defined in relations to access the stored data quickly and efficiently
- ✓Used to create relationship between different relations or tables

Types of keys



Primary Key

- Attribute or set of attributes that uniquely identifies a tuples in relation

Important points:

❖A relation can have only one primary key

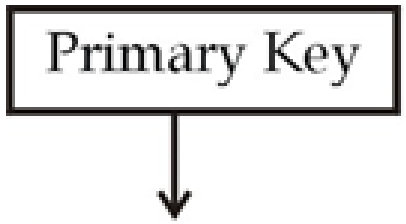
❖Each value in primary key attribute must be unique

❖Primary key cannot contain null values

Remember!

Tuples are also called records or rows

Example of Primary Key



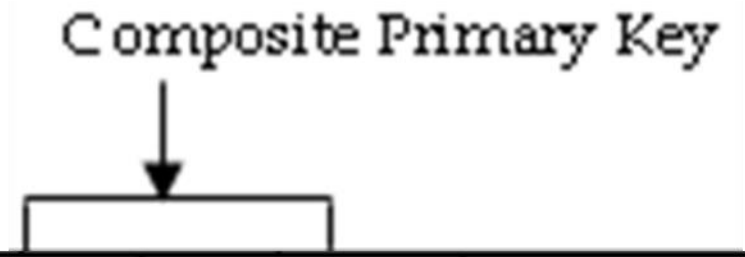
RollNo	Name	DOB	Address	Phone
1	Ali Raza	05/11/1998	21 Mall Road, Lahore	1234567
2	Asif Naeem	01/01/2000	42 Jail Road, Lahore	2642707
3	Hamza Riaz	02/03/2001	12 Tufail Road, Lahore	7234207

STUDENT

Composite Key

- A primary key that consists of two or more attributes
- Used in the situation where a single column is unable to uniquely identify a record in a relation
- Example?

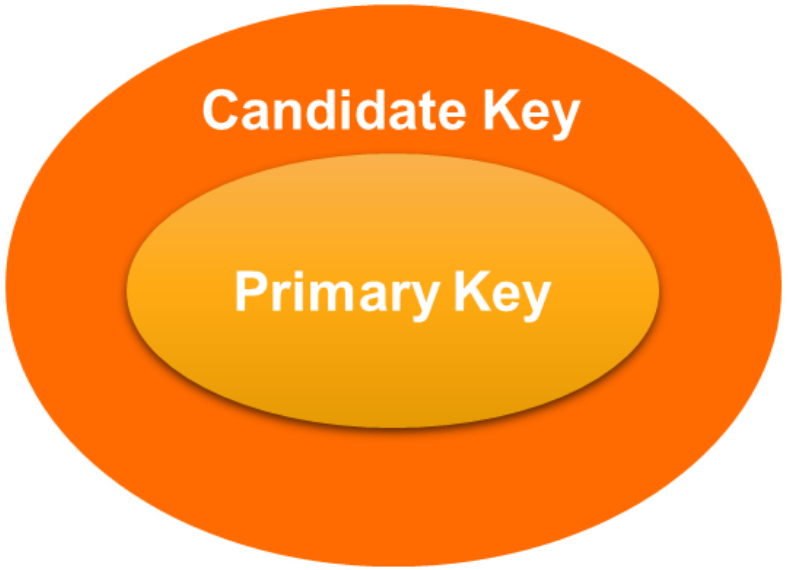
Example of Composite Primary Key



RollNo	Subject	Marks
1	English	52
1	Math	77
1	Computer	64
2	English	58
2	Math	69
2	Computer	49
3	English	82
3	Math	98
3	Computer	86

Candidate Key

- Relation may contain attribute or set of attributes that can be used as primary key
- Candidate key is a attribute or set of attributes that can be used as primary key
- A relation may contain many candidate keys

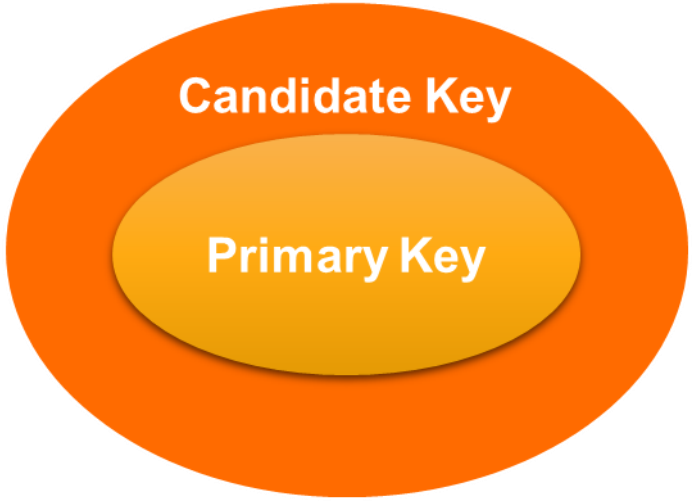


Example of Candidate Key

RegNo	RollNo	Name	DOB	Address	Phone
UAF-001-2016	1	Ali Raza	05/11/1998	21 Mall Road, Lahore	1234567
UAF-002-2016	2	Asif Naeem	01/01/2000	42 Jail Road, Lahore	2642707
UAF-003-2016	3	Hamza Riaz	02/03/2001	12 Tufail Road, Lahore	7234207

Alternate Key

- The candidate key that are not selected as primary key
- May be used for search unique values but not a Primary Key



Example of Alternate Key

Primary Key

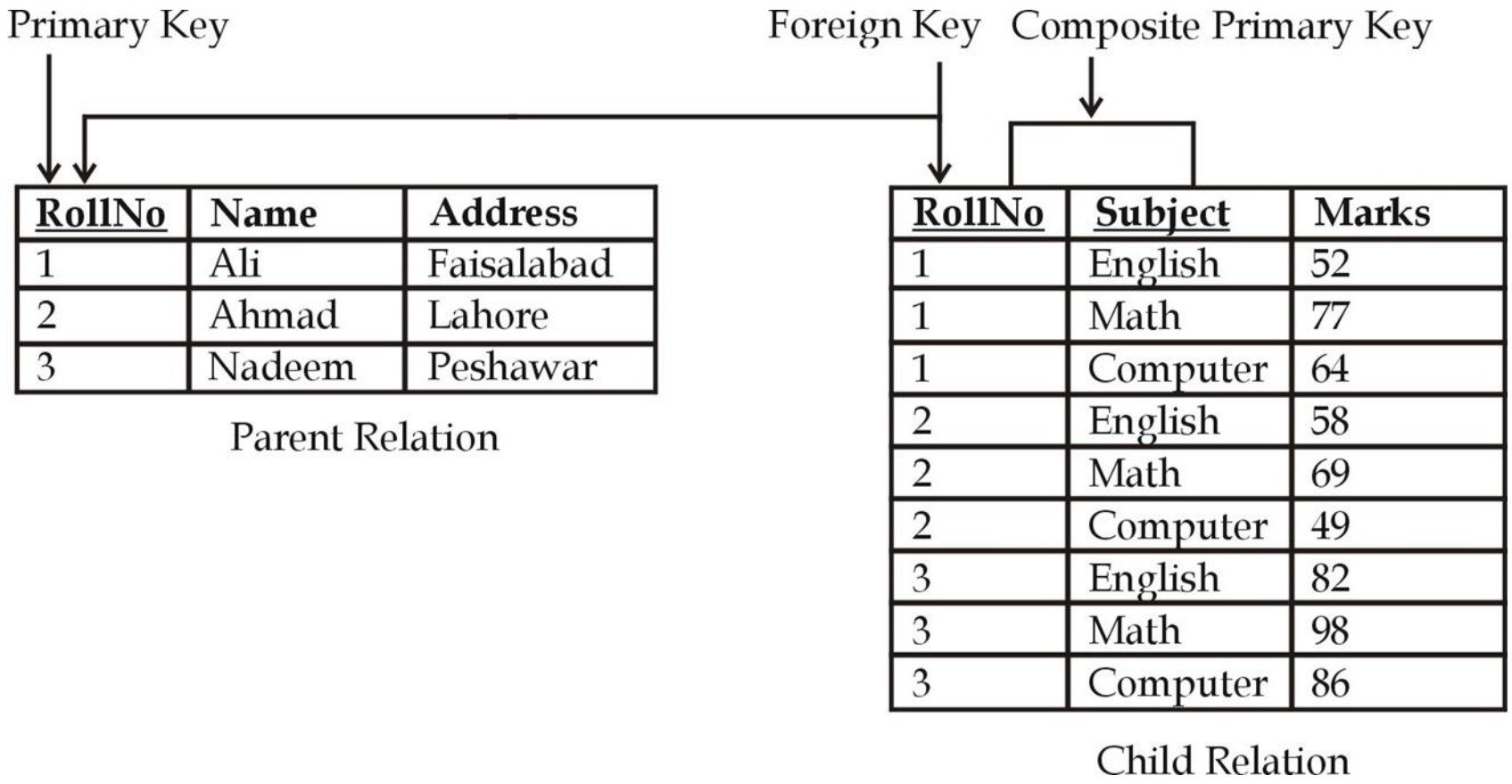
Alternate Key

RegNo	RollNo	Name	DOB	Address	Phone
UAF-001-2016	1	Ali Raza	05/11/1998	21 Mall Road, Lahore	1234567
UAF-002-2016	2	Asif Naeem	01/01/2000	42 Jail Road, Lahore	2642707
UAF-003-2016	3	Hamza Riaz	02/03/2001	12 Tufail Road, Lahore	7234207

Foreign Key

- A foreign key is an attribute or set of attributes in a relation whose values match a primary key in another relation
- The relation in which foreign key is created is known as **dependent relation** or **child relation**
- The relation to which the foreign key refers is known as **parent relation**
- The key connects to another relation when a relationship is established between two relations
- A relation may contain many foreign keys

Example of Foreign Key



RollNo	Name	Address
1	Ali	Faisalabad
2	Ahmad	Lahore
3	Nadeem	Peshawar

Parent Relation

RollNo	Subject	Marks
1	English	52
1	Math	77
1	Computer	64
2	English	58
2	Math	69
2	Computer	49
3	English	82
3	Math	98
3	Computer	86

Child Relation

Secondary Key

- Secondary key can be used to access/retrieve records
- Values may not be unique
- One secondary key may refer to many records

Example of Secondary key

- An attribute “City” in Student relation can be used to display all students who live in specific city

Control / Sort Key

- Sort key is set of attributes that is used to physically sequence the stored data
- Also known as control key
- Stored data can be sorted in different ways according to the user requirement
- An attribute “Name” in Student relation can be used as sort key to display all students alphabetically by name

Usage of Index FMS and DBMS

- Data structure used by DBMS to speed up the sorting and searching process
- Indexes may be created on key(primary, secondary, foreign)
- Created by System developer or DBA
- Some indexes are created automatically in the related tables when relationship are defined
- Indexes are stored in index file
- Indexes can slow down data entry and editing because index file is also updated each time data is added or modified

Role of Database User

1. Users / End User

- Persons who directly interact with database system to perform different operations
  - Use the data for queries
  - Data Entry using Forms
  - Print result using Reports
- Use database application without technical knowledge of databases
- End user interact with the database through interface
- Don’t write any program
- End user must have knowledge of the installed software to be used

Role of Database User

2. Data Administrator

- Persons who is responsible for entire data resource of an organization
- Develops overall functional requirements for the database used in organization
- Establishes the data standards
- Supervises the data distribution within the organization
- Communicates with the users when necessary
- Participates in developing the data dictionary and prepares documentations
- Conducts user training when needed

Role of Database User

3. Database Administrator

- Responsible for the design, implementation, operation, management and maintenance of database
- Must be technical competent having excellent communication, managerial and diplomatic skills:
  - Managerial skills are important in planning and coordinating and carrying out different tasks
  - Technical skills are required to understand the complexity hardware and software
  - Diplomatic skills are important in communicating with users and determining their needs etc.

Role of Database Users

Responsibilities of DBA

- Installation of database software
- Monitoring of database System
- Solution of any problem that occurs in the database
- Assigning permission to different users to use database system
- Taking regular Backups
- Restore the system in case of problems or system crash

Data Manipulation in DBMS

- Stores and manipulates data in tables or relations
- Tables or relations may be connected with each other
- Used index to search data quickly
- Used SQL to perform different operations
- Provides facility to insert new data in database
- Provides facility to modify existing data in database
- Provides facility to retrieve existing data from database
- Provides facility to delete existing data from database

Thank you!