7

DATABAS

After completing this less will be able to:

- Differentiate between data and information
- Define file management system
- Define Database and Database Management System (DBMS)
- Identify advantages of DBMS over the file management system
- Identify the role of Database Administrator (DBA)
- Know the types of database models
- Know the types of database languages for relational databases
- Define the basic database terminologies
- Know how to plan a database
- Describe data modeling and draw Entity-Relationship (E-R) diagram
- Transform the E-R diagram to the Relational Schema
- Normalize relations up to third normal form

Reading

UNIT INTRODUCTION

A database is a collection of related files that are usually integrated, linked or cr referenced to one another. This unit is dedicated to database and database managem systems. It introduces the types of database models and provides the basic knowledge ab data modelling and E-R diagram for planning and development of a database system. It prese the advantages of using a database management system over the old file management syst It describes the responsibilities of database administrator for the performance, integrity security of a database.

7.1 INTRODUCTION TO DATABASE

Databases and database systems have become an essential part of everyday li modern society. Most of us encounter several activities that involve some interaction wi database. For example, if we go to the bank to deposit or withdraw money; if we make a l or airline reservation or if we access a computerized library catalogue to search for a b chances are that our activities will involve someone accessing a database. Even purcha

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items from a supermarket nowadays in many cases involves an automatic update of the database that keeps the inventory of supermarket items.

7.1.1 DATA AND INFORMATION

Data

Data refers to the facts and figures in raw form i.e. not in organized form. Data is the raw material given as input to the computer for processing. For example, the item code, description, quantity and price of items purchased in a store are data. When this data is entered into the computer and processed, it prints the bill which is the output of the computer.

Information

Information is the processed or organised form of data. When data is processed by the computer and it is properly arranged and organized, it is converted to information. It is also called the output of computer and is the meaningful form of data. For example, the names of students and their marks in all the subjects is data. When it is processed by the computer, the result sheets and report cards produced is information.

7.1.2 FILE MANAGEMENT SYSTEM

A file (or file based) management system is a collection of programs used for managing data stored in various files. Each program within a file management system is developed independently and it defines and manages its own data. In file management system records in the file are not related to the records in any other file. This approach leads to many problems which include data duplication in different files, data inconsistency, sharing of data and lack of flexibility in organizing and querying the data.

For example, a company may store a salesman's name, address telephone number and commission rate in a file in Accounts Department and the same information may be stored in other file in Sales Department. The Accounts Department, for example, may change the commission rate of salesman but the Sales Department may fail to update its file. This will produce reports calculated with out-of-data figures. The inconsistency in files occurred due to duplication of same data in files. This is the main problem faced in file management systems.

7.1.3 DATABASE

In order to solve the problems of traditional file management system for managing data, concept of a database was introduced. A *database* is a collection of related data. For example, consider the names, telephone numbers and addresses of the people you know. You may have recorded this data in an indexed address book or you stored it on your computer's hard disk using software such as Microsoft Access or Excel. This is a collection of data having implicit meaning and hence is a database.

A database can be of any size and complexity. For example, a database containing names and telephone numbers of your friends may have only a few records. On the other hand,

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a database containing information about all the citizens of a country for National Ident (NIC) may contain millions of record.

A database may be created and maintained manually or it may be computeriz library card catalogue is an example of a manually created and maintained data computerized database is created and maintained by a database management syst example Library management system, Stock control system, Examination control syste

7.1.4 DATABASE MANAGEMENT SYSTEM (DBMS)

A database management system (DBMS) is a set of programs that allow users to maintain and manipulate database, and store or retrieve data from those database provides user-friendly access and controls between user and database. Its main purpo improve data sharing, data access, decision making and increase end user productivity

Manipulation of data includes the following.

- Adding new data, for example adding details of new student.
- Deleting unwanted data, for example deleting the details of students who have completed course.
- Changing existing data, for example modifying the fee paid by the student.

The DBMS helps to create an environment in which users have better access t DBMS helps to give an integrated view of the organization's operations. The DBMS m possible to share the data in the database among multiple applications and users.

Some examples of the database systems managed by DBMS are:

- Customer information system
- Inventory information
- Library management
- Accounting and bookkeeping

Examples of DBMS include Microsoft Access, Microsoft SQL Server, Sybase, Oracle, M etc.

7.1.5 ADVANTAGES OF DBMS OVER FILE MANAGEMENT SYSTEM

DBMS has many advantages over the file management system because it p solutions to all the problems faced in file management system. The following problem faced in file management system.

Reduced Data Redundancy: Data redundancy is the duplication of data in many differe in file management system. For example, a salesman's data may be held on a file in the Department and also Personnel Department. When data is to be updated, it must be ch in both files. This results in wastage of storage space and may lead to data inconsistenc

This problem is not faced in DBMS because all the data belonging to the organization is centralized in a common pool of data, accessible by all the programs.

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ta consistency: In file management system, same data may be held in several different files. as to be updated in each separate file when it changes. If data is not updated in any file it uses data inconsistency.

This problem is solved in DBMS because all the data is centralized for use by all the grams. For example, in a school, students' information such as name, address, phone nber and class are held in a file in Admission Office. The same data with tuition fee and some er data is also kept in another file in Accounts Office. If a student's address changes it must updated on both files. In case it is updated in only one file, the other file will have out-of-date a. This will cause data inconsistency.

ogram-Data Dependency: In file management system, every computer program in each partment has to specify exactly what data fields constitute a record. Any change to the format he data field of a record, such as adding a new field or changing the length of a field means t every program which uses that file has to be changed. For example, if a new field, place of h of students is to be added in student data files in Admission Office and Accounts Office, n both the programs need to be changed.

ck of Flexibility: In file management system, when information of a non-routine nature is eded, it can take weeks to assemble the data from the various files and write new programs produce the required reports. For example, a report about students is required in a school t has to merge information stored in various files. This will require lot of time and effort by the ogrammer to write a program to print such a report in file management system whereas it can very easily produced in database management system.

ta not Sharable: When a copy of a data file is made for sharing data with other people in a management system, it will soon lead to data inconsistency if data in one of the files is not dated. Therefore, it is difficult to share data with others in a file management system.

ckup and Recovery: DBMS provides facilities for backup and recovery from failures luding disk crash, power failure, software errors, which may bring the database from the consistent state to a state prior to the failure.

ta Security: In Conventional filing systems there is no centralized security system which stricts users according to their role in the organization. DBMS makes it easier to enforce curity restrictions since database is centralized. Users are provided permissions to access ta according to their rights.

1.6 ROLE OF DATABASE ADMINISTRATOR (DBA)

Database Administrator (DBA) is the person responsible for supervising the database and e use of DBMS in an organization. DBA has the following responsibilities.

- Designing the database and enforcing the operational policies and procedures for its usage
- Planning security measures and backup of database
- Controlling privileges and permissions of database users

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- Allocating passwords to users
- Planning recovery procedures if hardware or software failure occurs and ens
  data is lost.
- Providing training to new employees about using the database

7.1.7 DATABASE MODELS

A database model is the theoretical foundation of a database and determi
manner data can be stored, organized and manipulated. It defines a way of stru
There are five types of database models.

Hierarchical Database Model

In a hierarchical model, data is organized into a tree-like structure as shown
is a logical construct with owner and subordinate relationship. Data elements in a
relationship are called members
having subordinates are called p
hierarchical structure subordinates
only a single owner and there is or
element that has no owner. This
very suitable in describing many rela
the real world. Some examples of
model are table of contents, depart
organization and types of memories

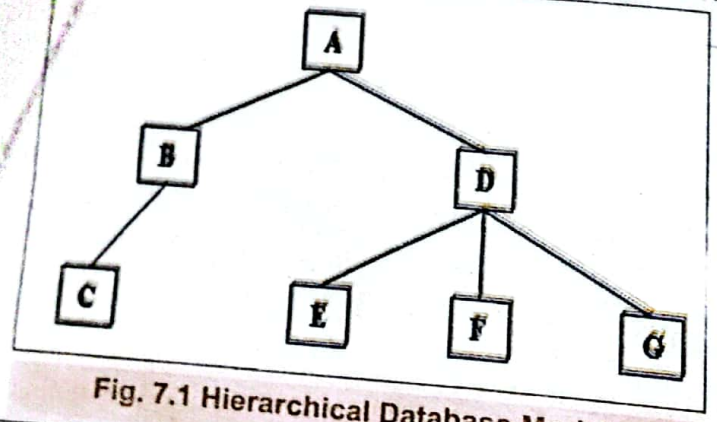

Fig. 7.1 Hierarchical Database Model

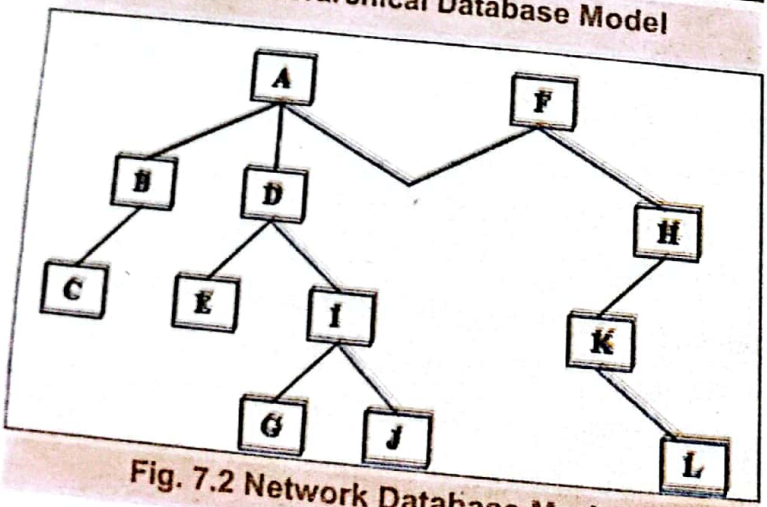

Fig. 7.2 Network Database Model

Network Database Model

A network model is a logical struct
some of the data elements can hav
one owner data element as shown i
network is a more complex struct
hierarchical model. A hierarchical m
thought of as a network with som
imposed on it. An application with
members, aircraft, routes and sch
related is by its nature a network mo

Relational Database Model

used in our

In a relational database model, data is held in tables as shown in Fig 7
tables are linked by means of common fields. The "relation" in a relational databa
the various tables in the database which are linked with each other. A table in databa
of rows and columns. One row of table holds one record. Each column in the table
field or attribute.

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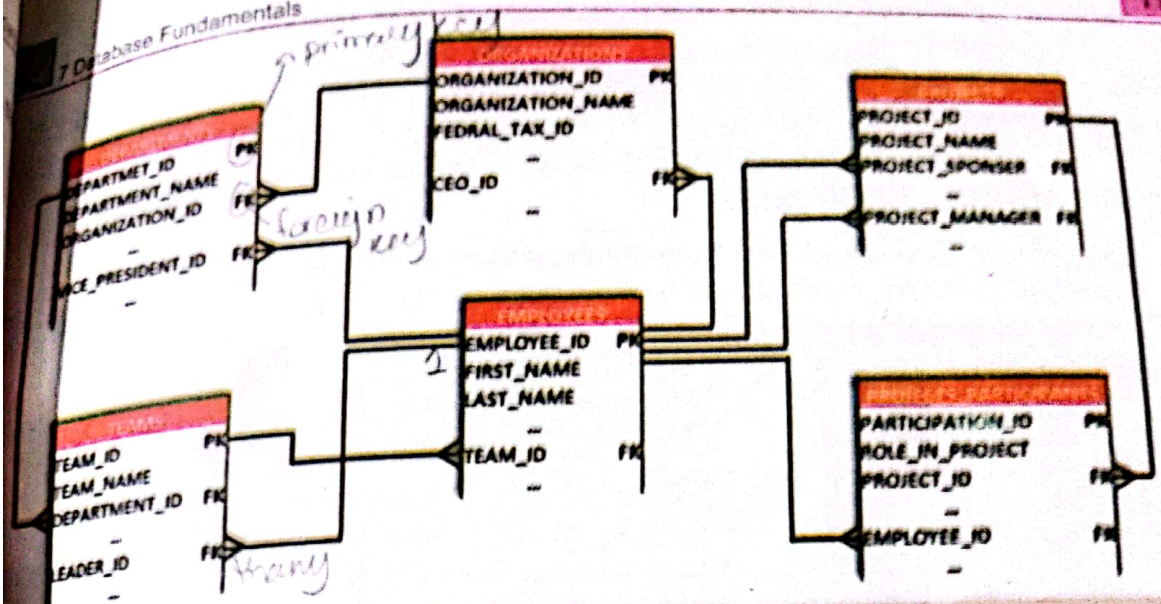

Fig.7.3 Table in a relational database

The relational database model is used to make database management systems mo
pendent of any particular application. It is the most popular database model used in busine
cations.

ct-Oriented Database Model

Object-oriented databases are also called Object Database Manageme
ems (ODBMS). Object databases store objects rather than data such as intege
numbers and strings. Objects are used in object oriented programming languag
as C++ and Java.

Object:	Radio
States	Behaviours
on	turn on
off	turn off
current channel	tune channel
volume	increase/decrease volume

Fig.7.4 States and Behaviour of object Radio

Real world objects have two characteristics, that is, state and behaviour
le, the object radio has four states and five behaviours as shown in Fig.7.
stores its states in variables and exposes its behaviour through functio
mming languages.

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Object Relational Database Model

An Object Relational Database (ORD) is a database management system relational database, but with an object-oriented database. In object relational data approach is essentially that of relational database. The data resides in the databa manipulated collectively with queries in a query language.

7.1.8 DATABASE LANGUAGES

SQL (Structured Query Language) is a standard language for accessing and ma databases. There are three types of SQL languages for relational databases. These a

- Data Definition Language
- Data Manipulation Language
- Data Control Language

Data Definition Language

Data Definition Language (DDL) is a computer language for defining diffe structures. DDL statements create, modify and remove data objects such as table important tasks of DDL are:

- To create objects in a database model
- To alter the structure of the database
- To delete objects from the database

Data Manipulation Language

Data Manipulation Language (DML) statements are used to manage or manipu Some examples of DML tasks are:

- To retrieve data from a database
- To insert data into a table
- To update existing data within a table
- To delete records from a table

Data Control Language

Data Control Language (DCL) is used for controlling the data. A user can acces based on the privileges given to him. Some important tasks of DCL are:

- To allow specified users to perform specific tasks
- To disallow specified users from performing specified tasks
- To cancel previously granted or denied permissions

7.2 BASIC DATABASE TERMINOLOGIES

An effective DBMS provides users with timely, accurate and relevant informa information is stored in computer files, which needs to be suitably organized and maintained so that users can easily access the information they need.

The following are some important terms used in database.

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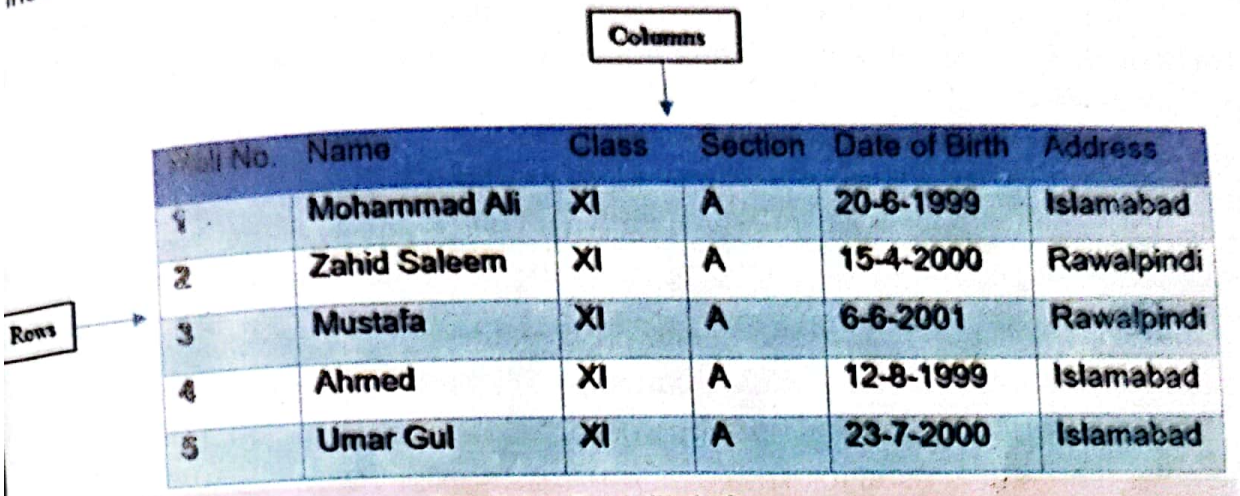
Relation

database table is a file that contains data about a single entity. An entity can be a person, r event, etc. For example 'Student', 'Teacher', 'Stock', etc. are entities. A database table posed of rows and columns. Rows hold the records and columns hold the fields. Data inserted at each row and column intersection. Tables are also called relations in RDBMS.



Roll No.	Name	Class	Section	Date of Birth	Address
1	Mohammad Ali	XI	A	20-6-1999	Islamabad
2	Zahid Saleem	XI	A	15-4-2000	Rawalpindi
3	Mustafa	XI	A	6-6-2001	Rawalpindi
4	Ahmed	XI	A	12-8-1999	Islamabad
5	Umar Gul	XI	A	23-7-2000	Islamabad

Fig. 7.5 A Table/Relation

Each table in a database holds data about a different but related subject. Fig. 7.5 shows tabase table containing data about the entity 'Student'.

ord/Tuple/Row

A collection of related fields treated as a single unit is called a record. All the information ut one person or item is held in a record. When records are stored in a table, rows represent ords and columns represent fields. In relational database rows are also known as tuples. abase table in Fig. 7.5 has five records, represented row wise, about the entity 'Student'.

lds/Attribute/Column

ield or attribute is part of a record and contains a single piece of data for the subject of the ord. In the database table illustrated in Fig.7.5, each record contains six fields:

oll No.	Used to assign a unique roll number to a student.
ame	Used to give name of the student
lass	Used to give class of the student
ection	Used to store the section of the student
Date of Birth	Used to give date of birth of the student
ddress	Used to give the address of the student

Fields appear as columns in a database table.

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File

A file is a collection of records. For example a stock file contains records for items payroll file contains records for employees and so on. In a relational database record in files called tables/relations. Fig. 7.5 shows a table/relation of 'Student' file.

View

It is made up of rows and columns. It may display information that is restricted of table. It may also present selected data from several tables simultaneously. View independently of tables.

Data Types

Every field in a table is assigned a data type. Data types available in a relational are character data, integers/real numbers, Boolean data, date/time, etc.

- Character: It is used to store text and combinations of text and numbers
- Integer: It is used to store whole numbers such as 34 and 2073.
- Real numbers: It is used to store numbers that have fractional part such as 2
- Boolean data: It is used for True or False values. Null values are not allowed
- Date and time: It is used for storing date and time.

Key

It is an attribute (or field) that is used to identify records in a table. The purpose to link data together between tables without repeating all of the data in every table. T are the types of keys used in databases.

Primary Key: Each entity in a database must have a unique key field known as pri identify a record. For example, Roll Number of a student can be used as primary key database (Fig. 7.5) since it is unique key field.

Candidate or Alternate Key: A key field that can act as a primary key field in a table identify each record but it is not chosen as primary key is known as candidate or al For example, Roll Number of a student is chosen as primary key field in a studen N.I.C. Number of a student is unique and it can also act as primary key. Therefore, N is a candidate or alternate key.

Secondary Key: Sometimes a records in a table need to be searched on field other key such a field is known as secondary key. For example, a student table needs t by name. Then name becomes secondary key. used for searching

Foreign Key: A key field used in a relationship between tables whose value match key in the other table is known as foreign key. Suppose a student database has Student table that contains students' particulars and another Result table that co results. Student table is the primary table in which Roll Number is primary key. To link table and the Result table, the field Roll Number can also be used as foreign key table.

can be not duplic

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Q- What is problem identification in planning a database?

Q- What is the purpose of feasibility study?

Q- What is the purpose of requirement analysis?

Q- What is the next step after requirements identification? Pg#116

7.3

Database planning is a s
oncept to design and dev
tent data entry and retri
fforts and make it perfc
se depends on its compl

The following steps are i

of database that moves
ined database promotes
systematic way to save
work required to plan a

m Identification/Definit

In this step the nature and scope of the problem, to be solved, is identified and the
n is clearly defined. The database developers must know what type of information is given
nat are the unknowns. They have to analyse the problem to gather as much information
sible for finding a solution. For example, the Examination Section Head of a College has
getting complaints of poor Examination services from the Examination department. This
ead an initial investigation to find whether a new system can solve the problem. If the
suggests a new system, this leads to the next phase which is the feasibility study of the
ystem.

ility Study

The purpose of feasibility study is to find one or more solutions of the problem and
ggest the most desirable and economical solution. For this purpose the database
oper needs to generate several solutions of the problem to accomplish the desired
nd propose one solution. Feasibility study includes the following.

- Investigate the problem
- Find out all the possible solutions available
- Study all the solutions to determine their feasibility
- List the issues with each solution
- Select the preferred solution for implementation
- Document the results in a feasibility report Jump

rement Analysis

The purpose of requirement analysis is to obtain thorough and detail
standing of the problem. It is important to create a complete and accura
sentation of all the requirements. Only then, it is possible to develop a database tl
atisfies the requirements.

For example, to develop 'College Examination System' a detailed study is needed
se the requirements. This will include the following:

- Entities required i.e. the number of tables (database files) required (like Student, Ex
Exam Type, Result, Courses, etc.)

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- Fields required for each entity in each table (like Roll No., Name, Class, Sec Student entity)
- Key field in each table
- Data types to fields
- Relationship between entities
- Queries
- Forms design
- Reports

Identify Entities and Attributes

After requirements identification, the next step is to identify the entities and it An entity is the main data object that is of significant interest to the organization. It is person, place, thing, or event to be recorded in the database.

An Attribute is a property that describes an entity. For example if employee is an ent employee's name, age, address, salary and job etc. are the attributes

For example, to develop 'College Examination System' the following attributes will be required as shown in Fig. 7.6.

Entities	Attributes
Student	Roll_number, Name, Class, Section, Date of birth,
Course	Course_Id, Course_name, Description
Exam	Exam_Id, Exam_name, Start_date
Exam_result	Marks

Fig. 7.6 Entities and Attributes of Examination System

Assigning Names to Tables and Columns

Once entities and attributes are identified, entities are converted to tables a to columns of the tables. There are no standard conventions for naming tables and all names should be meaningful and consistent throughout the database. For examp for Student's table. In case of attributes, meaningful names should be used where columns (attributes) may be assigned the names, Roll number, Name, Class, Sec birth, Address. The table Student is shown in Fig.7.7 with three records.

For example, the College Exam System may have the table name 'Stud

Roll_number	Name	Class	Section	Date of birth	Address
1	Ali	XI	B	23/5/2000	Islamaba
2	Gohar	XI	B	01/6/1999	Rawalpi
3	Mustafa	XI	B	12/7/2001	Islamaba

Fig.7.7 Table Student with three records

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7.4 DATA MODELING AND ENTITY-RELATIONSHIP DIAGRAM

7.4.1 DATA MODELING

Data modeling is the process of designing logical structure of a database with a diagram sing text and symbols to represent the way data needs to flow. This diagram is called Entity-elationship diagram (ERD). Data models define how data is connected to each other and how ey are processed and stored inside the system. Data models are built during the analysis and sign phases of a project to ensure that the requirements for a new application are fully derstood. A data model can be thought of as a diagram or flowchart that illustrates the ationships between data. Well-documented conceptual, logical and physical data odels allow stake-holders to identify errors and make changes before any ogramming code has been written.

Data model designers often use multiple models to view the same data and ensure that processes, entities, relationships and data flows have been identified. There are several fferent approaches to data modeling, including:

onceptual Data Modeling - identifies the highest-level relationships between different entities.

nterprise Data Modeling - similar to conceptual data modeling, but addresses the unique quirements of a specific business.

ogical Data Modeling - illustrates the specific entities, attributes and relationships involved in business function. Serves as the basis for the creation of the physical data model.

hysical Data Modeling - represents an application and database-specific implementation of a gical data model.

When a system developer designs a new database system, one crucial task is to entify and state the data needs of the organization. This describes how the data ements in the system are to be grouped.

he following terms are used in building a picture of the data requirements.

ntity: An entity is a thing of interest to an organization about which data is to be held. Examples entities include Student, Customer, Employee, Stock Item, Supplier, etc.

ttribute: An attribute is a property or characteristic of an entity. Examples of attributes ssociated with a Customer include Customer ID, Surname, Initials, Title, Address, etc.

elationship: A relationship is a link or association between entities. An example is the link etween Dentist and Patient; one dentist has many patients, but each patient has only one entist.

eys: It is an attribute used to identify a record in a database. Keys are used to create links etween tables to avoid duplication of data in various tables.

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7.4.2 Entity-R

The Entit
database. It is
ER model is co
entities, attribut
represented wit
design of a data

l defines the conceptual
ns among them. At view
atabases. Any object, for
tributes of relationship
del is best used for the

ER Model is ba

- **Entities** and their attributes.
- **Relationships** among entities.

These concepts are explained in Fig. 7.8.

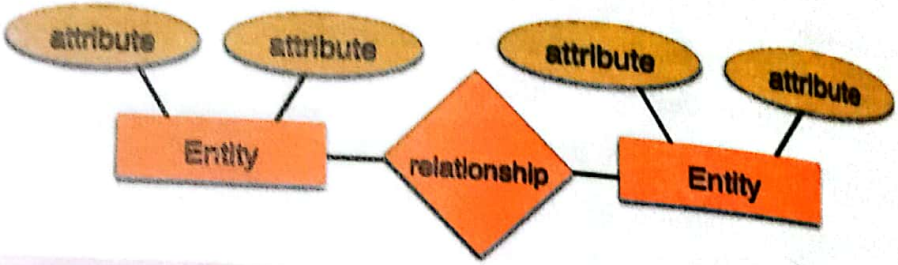

Fig.7.8 ER diagram concept

Entity

An entity in an ER Model is a real-world entity having properties called
Every **attribute** is defined by its set of values called **domain**. For example, in
database, a 'Student' is considered as an entity. Student has various attributes like
ame, age, class, etc. Entities are represented by means of rectangles. Rectangles
vith the entity set they represent. Fig. 7.9 shows some entities.

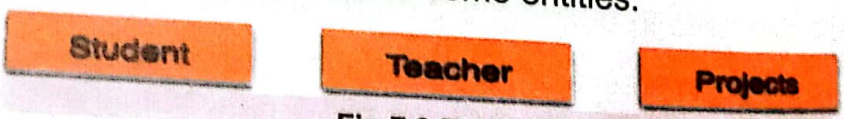

Fig.7.9 Entities

tributes

Attributes are the properties of entities. Attributes are represented by means
very ellipse represents one attribute and is
ectly connected to its entity (rectangle). Fig
0 shows three attributes 'Roll_No.', 'Name'
d 'BirthDate' of entity 'Student'. The primary
attribute is underlined, for example Roll_No.
ibute.

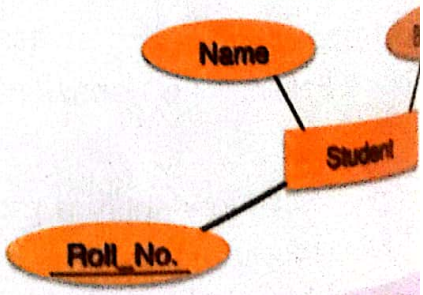

Fig.7.10 Attributes

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onship The logical association among entities is called **relationship**. Relationships are
ented by a diamond symbol connected to the related entities. Fig 7.11 shows some
nships between entities.

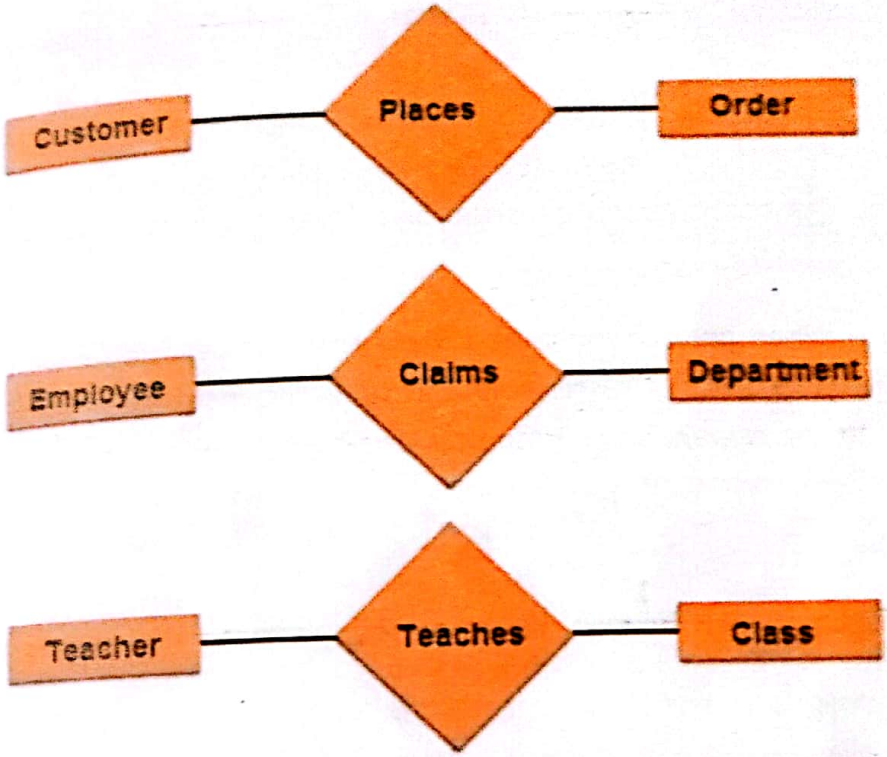

Fig.7.11 Relationships

e of a Relationship

he number of participating entities in a relationship is known as the degree of the
nship. It has two types.

ry relationship: It exists when an association is maintained within a single entity. It is known as a recursive relationship. Fig. 7.12 shows a unary relationship, in which only entity i.e. 'Machine Operator' is maintaining the recursive relationship.

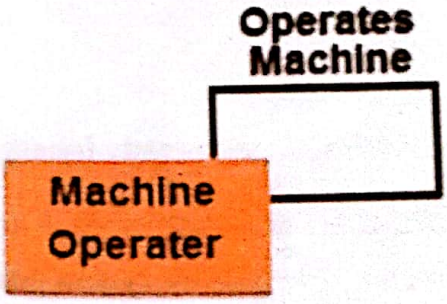

Fig.7.12 Unary Relationship

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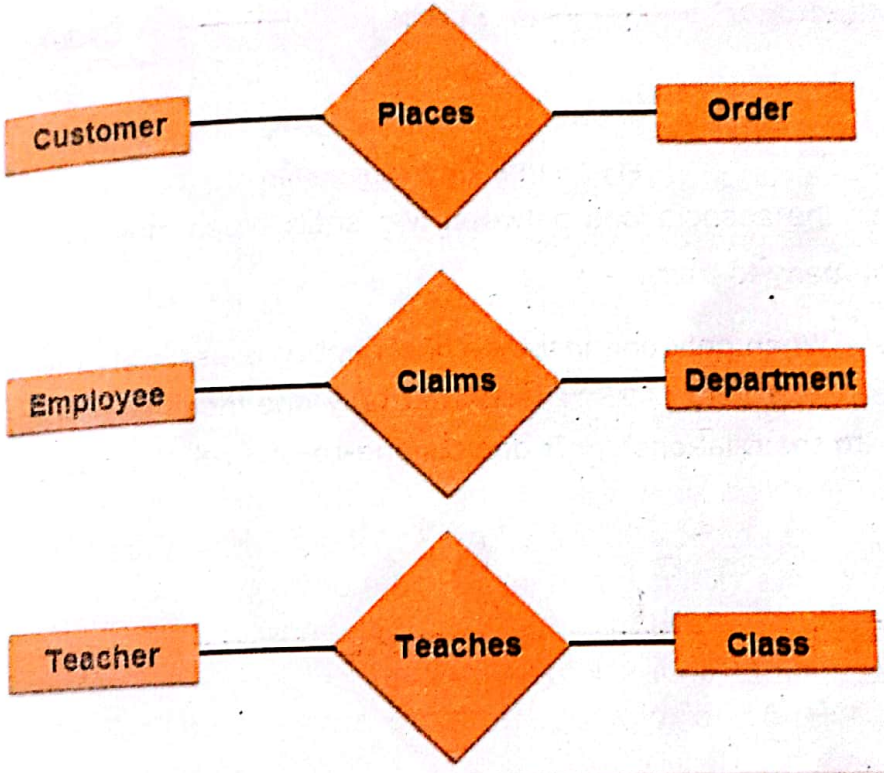

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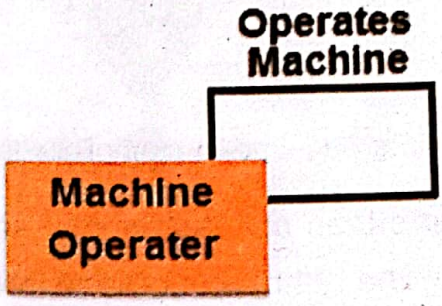

Fig.7.12 Unary Relationship

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ii. **Binary relationship:** It exists when two entities are associated with each other relationship. OR If there are two entity types involved.

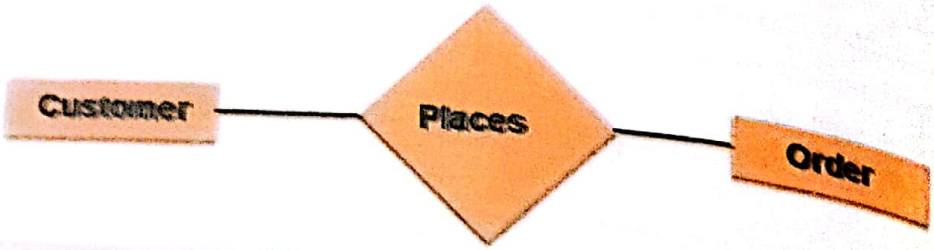

Fig.7.12 Binary Relationship

In binary relationship the associations between two entity types may be described one, one-to-many or many-to-many.

- **One-to-one** – When only one instance of an entity is associated with the rel it is marked as '1:1'. Fig. 7.13 reflects that only one instance of each entity associated with the relationship. It depicts one-to-one relationship.

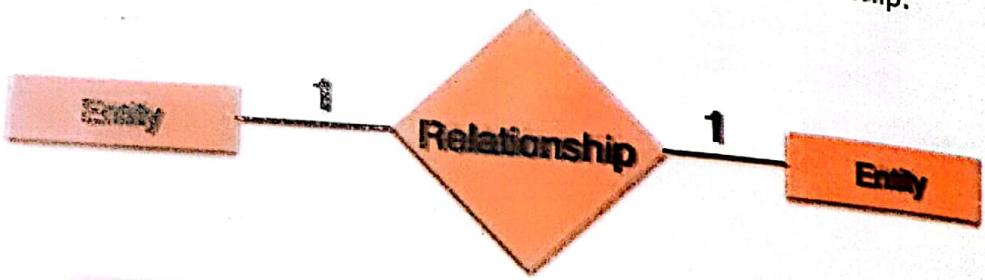

Fig.7.13 One-to-one Relationship

- **One-to-many** – When more than one instance of an entity is associat relationship, it is marked as '1:N'. Fig. 7.14 reflects that only one instance of the left and more than one instance of an entity on the right can be associate relationship.

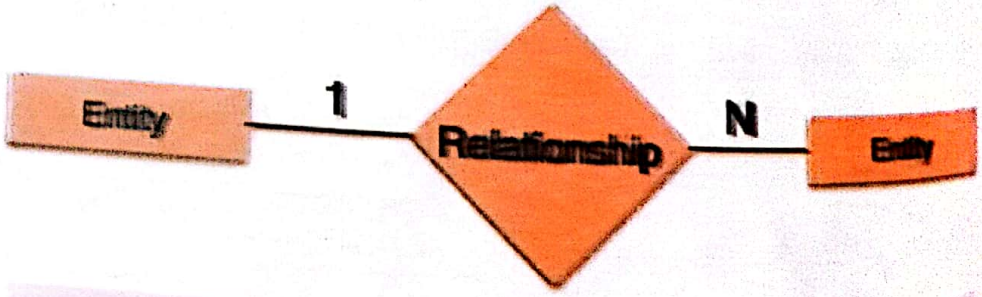

Fig.7.14 One-to-many Relationship

- **Many-to-many** – When more than one instance of an entity on the left and one instance of an entity on the right can be associated with the relationship shows many-to-many relationship.

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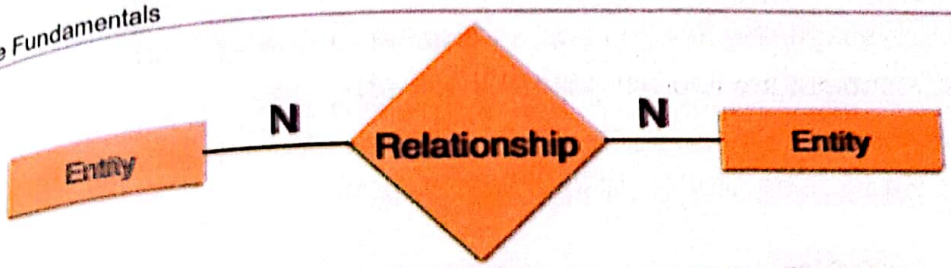


Fig.7.15 Many-to-many Relationship

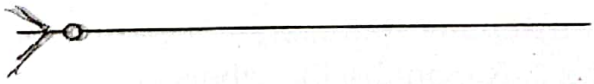
4.3 CARDINALITY AND MODALITY

Cardinality and modality specify the business rules in a relationship.

Cardinality refers to the maximum number of times an instance in one entity can be associated with instances in the related entity. An instance in a database is the actual content of the database at a particular point in time.

Modality refers to the minimum number of times an instance in one entity can be associated with an instance in the related entity.

Cardinality can be 1 or many and the symbol is places on the outside ends of the relationship line, closest to the entity. Modality can be 1 or 0 and the symbol is placed on the inside, next to the cardinality symbol. When cardinality and modality are specified together in a relationship between entities, for a cardinality of 1, a straight line is drawn. For a cardinality of many, a foot with three toes is drawn. For a modality of 1 a straight line is drawn and for 0 a circle in drawn. Cardinality and modality are shown at both ends of the relationship line.



Cardinality is many and modality is zero

Cardinality is many and modality is 1

Cardinality is 1 and modality is 1.

Cardinality is 1 and modality is zero.

Example 1:Let us draw E-R diagram of entity 'Student' and 'Seat' that specifies the cardinality and modality. A student fills a seat. This is a one-to-one relationship. This relationship can be drawn as shown in Fig.7.16.

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Cardinality: One student can fill a maximum of one seat. One seat can be maximum of one student. Each side of the relationship has a cardinality of one.

Modality: The modality on each side is also one. A student must fill at least and one seat must be filled by at least one student.

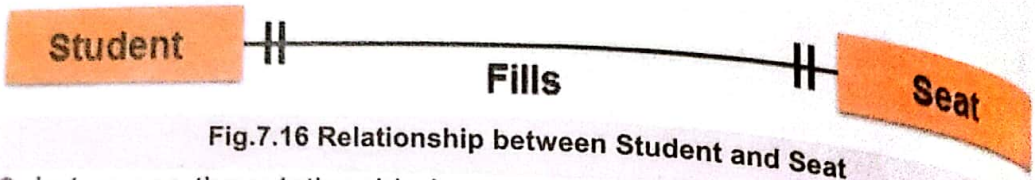

Fig.7.16 Relationship between Student and Seat

Example 2: Let us see the relationship between the entities 'Teacher' and 'Course'. teaches one or more courses. This is a one-to-many relationship. This relationship is Fig.7.17.

Cardinality: One teacher can teach many courses. One course is taught by teacher. The cardinality is one to many.

Modality: The modality is one on both ends of the relationship. One teacher m at least one course and a course must be taught by one teacher.

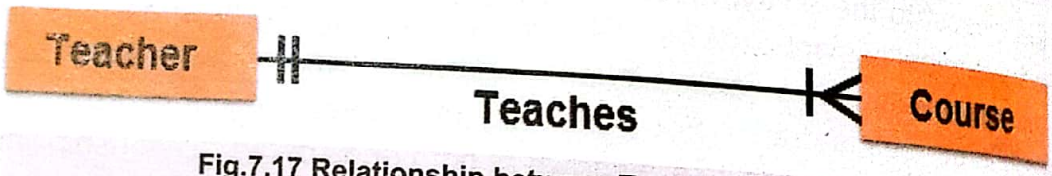

Fig.7.17 Relationship between Teacher and Course

Example 3: A 'Branch' of a company has many 'Departments' and each depa managed by a 'Manager'. The E-R diagram that shows the cardinality and modali is shown in Fig.7.8.

There are three entities in this example which are Branch, Department and Following are the cardinalities and modalities between these entities.

Cardinality between Branch and Department

- Each Branch has one or more departments.
- One Department can only be in one branch.

Therefore, cardinality between Branch and Department is one-to-many as sho E-R diagram (Fig. 7.18).

Fig.7.18 Relationship between Branch, Department and Manager

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Cardinality between Department and Manager

- Each Department is managed by a Manager.
- Each Manager belongs to only one Department.

Therefore, cardinality between Department and Manager is one-to-one.

Modality between Branch and Department

Modality between Branch and Department is one on both ends of the relationship because each Branch must have at least one Department and each Department belongs to only one Branch.

Modality between Department and Manager

Modality between Department and Manager is also one on both ends of the relationship because a Department must have at least one Manager and a Manager must manage one department.

7.4.4 ENTITY- RELATIONSHIP (ER) DIAGRAM - Examples

The following are few examples of E-R Diagrams for some systems like Library Management System, Student Management System and Ticket Booking System

Library Management System

Library Management Systems consists of three entities. The entities are Books, Readers and Staff. E-R diagram for Library Management System is shown in Fig.7.19.

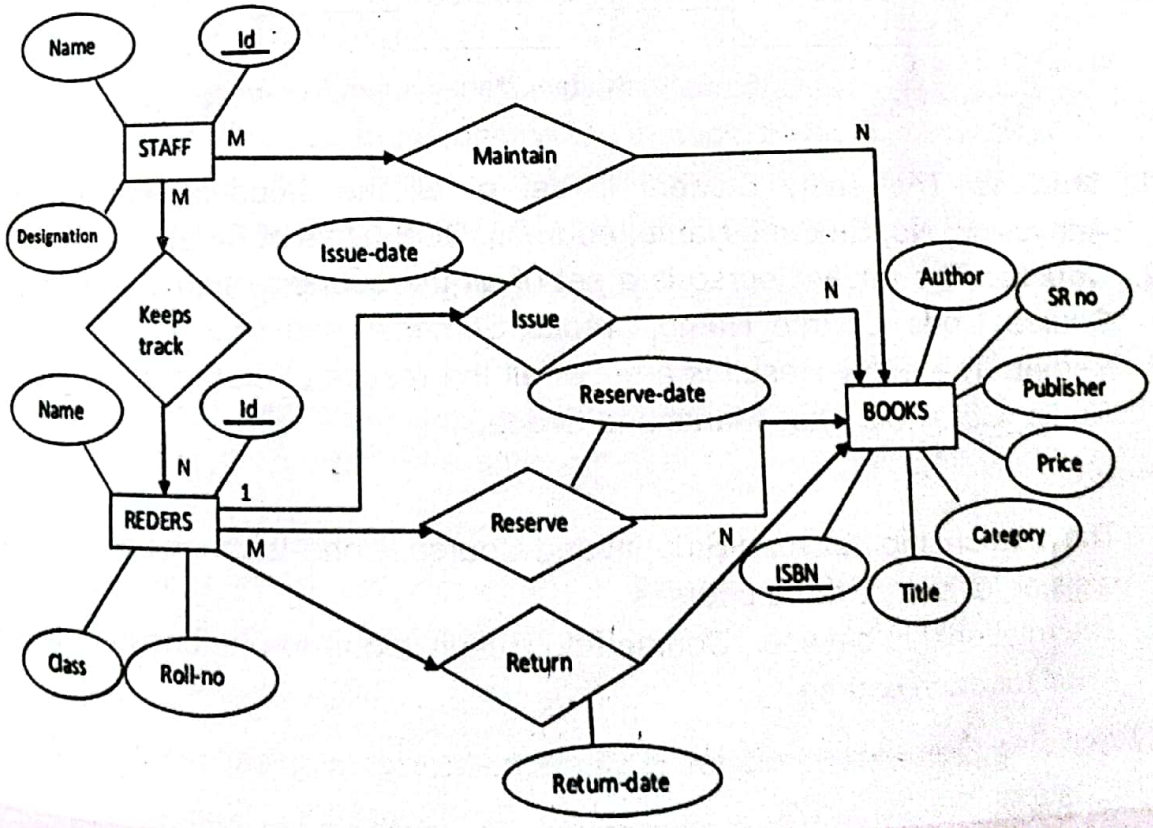

Fig.7.19 E-R Diagram for Library Management System

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Entities

1. **STAFF**: The entity STAFF is the all staff of the library and its attributes are key), Name and Designation.
2. **BOOKS**: The entity BOOKS is the all available books in the library. Its att ISBN (primary key), Title, Category, Price, Publisher, Sr no and Author.
3. **READERS**: The entity READERS is all the members of the library. Its att Id (primary key), Name, Class and Roll no.

Relationships

1. The relationship between Staff and Books is many-to-many because members are maintaining the books.
2. The relationship between Staff and Readers is many-to-many because members keep track of many readers.
3. The relationship between Readers and Books is one-to-many because a borrow one or more books.
4. The relationship between Readers and Books is many to many as many re reserve and also return many books.

Student Management System

Student Management System registers students for various courses and stores their results. It consists of three entities which are Student, Course and Result. E-R di student management system is shown in Fig.7.10.

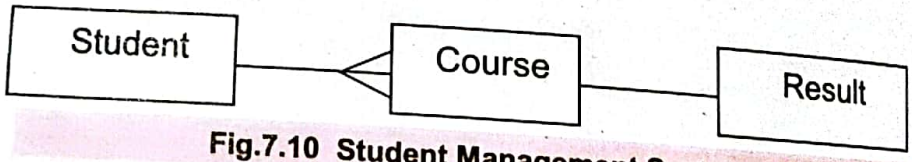

Fig.7.10 Student Management System

Entities

1. **Student:** The entity Student is set of all the students and its attrib Admission_No, Student_Name, Address, DOB (Date of Birth) and Tel_No.
2. **Course:** The entity Course is a set of all the courses offered and its attri Course_Code, Course_Name, Credits, Semester and Year.
3. **Result:** The entity Result is a set of all the results of students and its attri Marks_Obtained, Max_Marks and Grade.

Relationships

1. The relationship between Student and Course is one-to-many because a st register for one or more courses.
2. The relationship between Course and Result is one-to-one because there is result for each course.

Ticket Booking System

Ticket Booking System has three entities. The entities are Airlines, Flights and The E-R diagram for this is shown in Fig.7.11.

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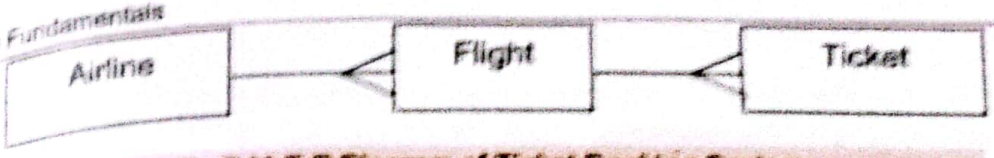

Fig.7.11 E-R Diagram of Ticket Booking System

1. **Airline:** The entity Airline is set of all the airlines and its attributes are Airline_Code and Airline_Name.
2. **Flight:** Attributes for Flight are Flight_Code, Departure_Location, Arrival_Location, Departure_Time, Arrival_Time, Departure_Date, Price and Seats_Available.
3. **Ticket:** Attributes for Ticket are Ticket_No, Passenger_Name, Address, Tel_No and Email_Address.

Relationships

1. The type of relationship between Airline and Flight is one-to-many because one airline has many flights.
2. The relationship between Flight and Ticket is also one-to-many since many tickets are booked for a single flight.

7.5 RELATIONAL SCHEMA not included

The word schema is a Greek word which means shape or plan. A database schema represents the structure of a database system in a formal language. It refers to the organization of data to construct a database.

7.5.1 TRANSFORM E-R DIAGRAM TO RELATIONAL SCHEMA

The E-R diagram represents the conceptual level of database design. It describes real-world entities. Although, E-R diagram is constructed in such a way to allow easy transition to relational model, it is not a simple process. A relational schema is at the logical level of database design. In a relational database, the schema defines the objects in the database.

The following steps transform E-R diagram to relational schema.

Transforming Entity to Relational Schema

An entity turns into a table. Suppose you have an entity named Student that has attributes, StudentID, Name, Class and Address. The entity Student will turn into a Student table.

Transforming Attribute to Relational Schema

Each attribute turns into a column (field) in the table. The attributes of our previous example of entity named Student will become columns in the Student table.

Transforming Relationships to Relational Schema

To transform a relationship in the E-R diagram to relational schema, you have to turn the primary key of the entity to the primary key in the table and make sure that foreign keys are in place in the schema to allow join between the tables.

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Transforming One-to-Many Relationship

To represent the one-to-many relationship, take the primary key of the table side and insert it as a foreign key into the table on the "many" side. This is the m use of a foreign key. It may make sense to rename the foreign key to reflect its re the table you are inserting into.

Transforming One-to-One Relationship

To represent a one-to-one relationship, you have to decide whether it makes to keep it as two separate tables or to join them together to make on big table. If y have two tables for a one-to-one relationship, you must decide which table will have key and which table will have the primary key of the other as foreign key.

As an example, suppose we want to develop a student database manageme store student particulars and their results of various examinations throughout the ye

The E-R diagram of this database has two entities, that is, Student and Exam relationship between these entities will be one-to-many as shown Fig.7.13 since st many examinations throughout the year.

Fig.7.13 E-R diagram of Student and Examination

Entity Student: It has the attributes, STUDENTID, NAME, CLASS and ADDRESS.

Entity Examination: It has the attributes, EXAM NAME, ENG, URDU, ISL, MATH COMP.

Now, let us transform this E-R diagram into relational schema.

The entities, Student and Examination, will turn into Student table and Exam respectively.

The attributes of both entities will turn into columns of the Student and Exami as shown in Fig.7.14.

To create relational schema between the entities, STUDENTID will be prima Student table since it has unique values and it will become foreign key in the Exami It makes sense to rename the foreign key as RESULTID in the Examination table relationship to the Student table. The Student and Examination tables will have relationship. For a single record in Student table, there may be multiple correspon in Examination table representing results of many examinations throughout the ye 1st Term, 2nd Term, Final, etc.

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STUDENTID	NAME	CLASS	ADDRESS

Student Table

RESULTID	EXAM NAME	ENG	URDU	ISL	MATH	PHY	COMP

Examination Table

process so more reliable producing a simpler and database structure is called Normalization

purpose =

Fig.7.14 Student and Examination tables

2 NORMALIZATION OF RELATIONAL DATABASE not included

Databases are normalized to avoid data redundancy and inconsistency. There are five nal forms for normalization of a database. The first three normal forms will be discussed here nderstand the concept of normalization. The rest are beyond the scope of this book.

t Normal Form

No repeating columns, no repeating values

To get to first normal form, we break up our data into its related data groups.

To understand how to obtain the first normal form, consider the table shown in Fig.7.15. tores information about members of library and the books borrowed by them.

emberID	Name	Tel_No	BookID	Title	Author	Pub_Date
1	Raja Imran	4815568	20056	Introduction to Java	Ali Ahmed	2006
31	Raja Imran	4815568	36211	Using Internet	Rizwan Khan	2009
32	Nasir Ali	2309116	20568	Computer Networks	Amjad Ali	1998
532	Nasir Ali	2309116	44195	Learning MS Word	Imran Khan	2010
532	Nasir Ali	2309116	31128	Web Designing	Waqas Arif	2011
669	Arif Khan	4212957	62617	Mastering MS Excel	Syed Fawad	2005

Fig. 7.15 Table in Un-normal Form

→ A relation is 1NF, if every intersection of row & column should contain 1 value only.
→ It also should not contain repeating columns.

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In this example, the primary key is the MemberID and we have two fields, Tel_No repeating themselves across the tuples for each of the different BookID redundant data will take lot of space to store the data and more time will be required through.

MemberID	Name	Tel_No
481	Raja Imran	4815568
532	Nasir Ali	2309116
669	Arif Khan	4212957

MemberID	BookID	Title	Author	Pub_Date
481	20056	Introduction to Java	Ali Ahmed	2006
481	36211	Using Internet	Rizwan Khan	2009
532	20568	Computer Networks	Amjad Ali	1998
532	44195	Learning MS Word	Imran Khan	2010
532	31128	Web Designing	Waqas Arif	2011
669	62617	Mastering MS Excel	Syed Fawad	2005

Fig. 7.16 Tables in First Normal Form

The rules of first normal form break this table into two and relate them to e repeated information in the table is removed. This will create the two tables shown in

The other normal forms are also obtained in a similar way by further breaking up and removing repeating information if it exists.

Second Normal Form (Removes Partial Functional Dependencies)

To move into second normal form, all partial functional dependencies must be Partial functional dependencies occur when there is a composite key and only one key is needed to determine one or more other attributes. To remove partial dependencies, we have to project out the partial functional dependencies into its creating two tables from one. 1) Table should be in 1F.

In our example, we have to further check if we are keeping more data than we ur relation. If we look at Fig. 7.16, we can see that for every UnitCode, we are also s InitName. It will make more sense, if we look up UnitCode 443 in another table an nitName. This is how we can avoid the duplicate information entered in the UnitN nitName is only dependent on UnitCode and has no dependency on StudentID. econd normal form, all partial dependencies must be removed. When we apply th

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ond normal form and remove the partial functional dependency in our database, we get the wing tables shown in fig. 7.17 which are in second normal form.

StudentID	UnitCode
481	UC443
481	UC471
481	UC422
532	UC443
669	UC471
669	UC468

UnitCode	UnitName
UC443	Database Design
UC471	Operating System
UC422	Digital Electronics
UC468	Accounting

Fig. 7.17 Table in Second Normal Form

ormal Form (Removes Transitive Functional Dependencies)

The next step is to move into third normal form. In order to reach third normal form, all sitive functional dependencies must be removed. Similar to partial functional dependencies, sitive functional dependencies occur when a non-key attribute can determine another non-attribute. Transitive functional dependencies are removed by projecting out the transitively endent attributes to another table while leaving the determinate as a foreign key in the nal table.

UnitCode	UnitName	CourseCode	CourseName
UC443	Database Design	COMP2010	Computing
UC471	Operating System	COMP2010	Computing
UC422	Digital Electronics	COMP2010	Computing
UC468	Accounting	BUS2010	E-Commerce

Fig 7.18 Table with CourseCode and CourseName attributes

In our example above, we have CourseName that is dependent on CourseCode and rseCode is dependent on Unitcode. Therefor, CourseName is transitively dependent UnitCode. To remove the transitional dependency, break the table into two tables,

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leaving the determinatnt as foreign key in the original table. This is shown in the Fig. 7.19. Here, CourseCode is foreign key in the first table and CourseCode is primary in the second table.

UnitCode	UnitName	CourseCode
UC443	Database Design	COMP2010
UC471	Operating System	COMP2010
UC422	Digital Electronics	COMP2010
UC468	Accounting	BUS2010

CourseCode	CourseName
COMP2010	Computing
BUS2010	E-Commerce

Fig 7.19 Table in Third Normal Form

Key Points

- Data refers to facts and figures. It is raw material that is input in the computer processing.
- Information is organized form of data that is meaningful and easily understandable by computer users. It is the output produced by computer after processing the data.
- A database is a collection of related data. A database consists of one or more tables and data files contain fields.
- A Database Management System (DBMS) is a collection of programs that enables to create and maintain a database.
- Database administrator (DBA) is the person in charge for supervising the database use of DBMS in an organization.
- In a Relational Database Model, data is stored in tables and the tables are linked by common fields. Each column of table holds one field and each row one record. most commonly used database model.

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All the information about one person or item held is a record. When records are stored in tables, rows represent records and columns represent fields.

Key is an attribute (or field) that is used to identify records in tables.

Entity is a thing of interest to an organization about which data is to be held. For example employees in an organization or books in a library.

Attribute is a property or characteristics of an entity.

Relationship is a link between entities. In a relational database, it is the link between tables.

Data modeling is the process of creating a conceptual data model that identifies the data needed by an organization to achieve its objectives.

An instance in a database is the actual content of the database at a particular point in time.

Cardinality refers to the maximum number to times an instance in one entity can be associated with instances in the related entity.

Modality refers to the minimum number of times an instance in one entity can be associated with an instance in the related entity.

Entity-Relationship (E-R) diagram is a diagrammatic way of representing the relationship between the entities of a database.

Normalization is a series of steps to create normal forms used to ensure that data anomalies are not created when information is inserted, updated or deleted.

(X) process of organizing data in relational DB inorder to minimize duplication of information. The basic purpose of the divided large table into smaller table. There normal form to normalize a database. 1st, 2nd, 3rd normal fo

Exercise

1. Select the best answer for the following MCQs.

i. Duplication of data in different files is called_____.

A. Data inconsistency
(B.) Data redundancy
C. Data overflow
D. Invalid data

ii. If data is not updated in a file in file based data management systems, what types of problem will it cause?

(A) Data inconsistency
B. Data redundancy
C. Data overflow
D. Invalid data

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Define primary and secondary key.
Define attribute and entity.
What is meant by instance?
Differentiate between cardinality and modality.
Define schema.
Why is it necessary to normalize a relational database?

3. Give long answers of the following questions.

What are the advantages of using a DBMS over file management system?
Define Database Administrator and describe the tasks performed by him.
Define database model and explain its types.
Describe the steps involved in database design.
What is an E-R diagram? Explain with examples.
What is Normalization? Explain the following Normal Forms 1NF, 2NF, 3NF

Lab Activities

ing lab activities are to be carried out during the practical periods.

city has many universities and each university has many departments. Each department s many teachers. Define the attributes for the entities, university, department and cher and draw the E-R diagram.

ompany sells many products to their customers. There are many suppliers who supply ous products. Draw the E-R diagram of entities, company, supplier and customer.

institute offers many courses. A student is allowed to register in only one course at a e. An instructor teaches many courses. Draw the E-R diagram of entities, courses, dent and instructor.

ty has many Cable TV companies. Each company has many TV channels. A customer scribes Cable TV from only one company. Draw the E-R diagram of entities, Cable TV pany, channels and customer.

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8

DATABASE DEVELOPMENT

After completing this lesson, you will be able to:

- Identify various relational database management systems
- Describe the steps involved in creating and saving a database
- Describe database toolbar, database window and Objects (tables, queries, forms and reports)
- Work with tables (create, add and edit tables in database, identify data types, create primary and create and edit relationship among tables, navigate through records in a table and add, modif records.
- Work with forms (create, save and edit a form; know different form views, navigate through records a form, add, modify and delete records)
- Work with queries (create, save, edit and edit queries)
- Generate and customize reports

Reading

UNIT INTRODUCTION

This unit is dedicated to relational database management systems. It provide training for developing database management systems using Access software b tables, forms, queries and reports.

8.1 INTRODUCTION

Databases are developed to provide facilities to store, manage and information in an organized way. Relational databases have been very succ organizations for managing databases. In relational databases, data is stored in ta relations between the tables make it a relational database. Database developmen the creation of database objects (tables, forms, queries, reports, etc.), keys and rel between the tables.

8.1.1 VARIOUS TYPES OF DATABASE MANAGEMENT SYSTEMS

There are three types of relational database management systems (RDBMS) Microsoft Access, OpenOffice Base, and SQL Server.

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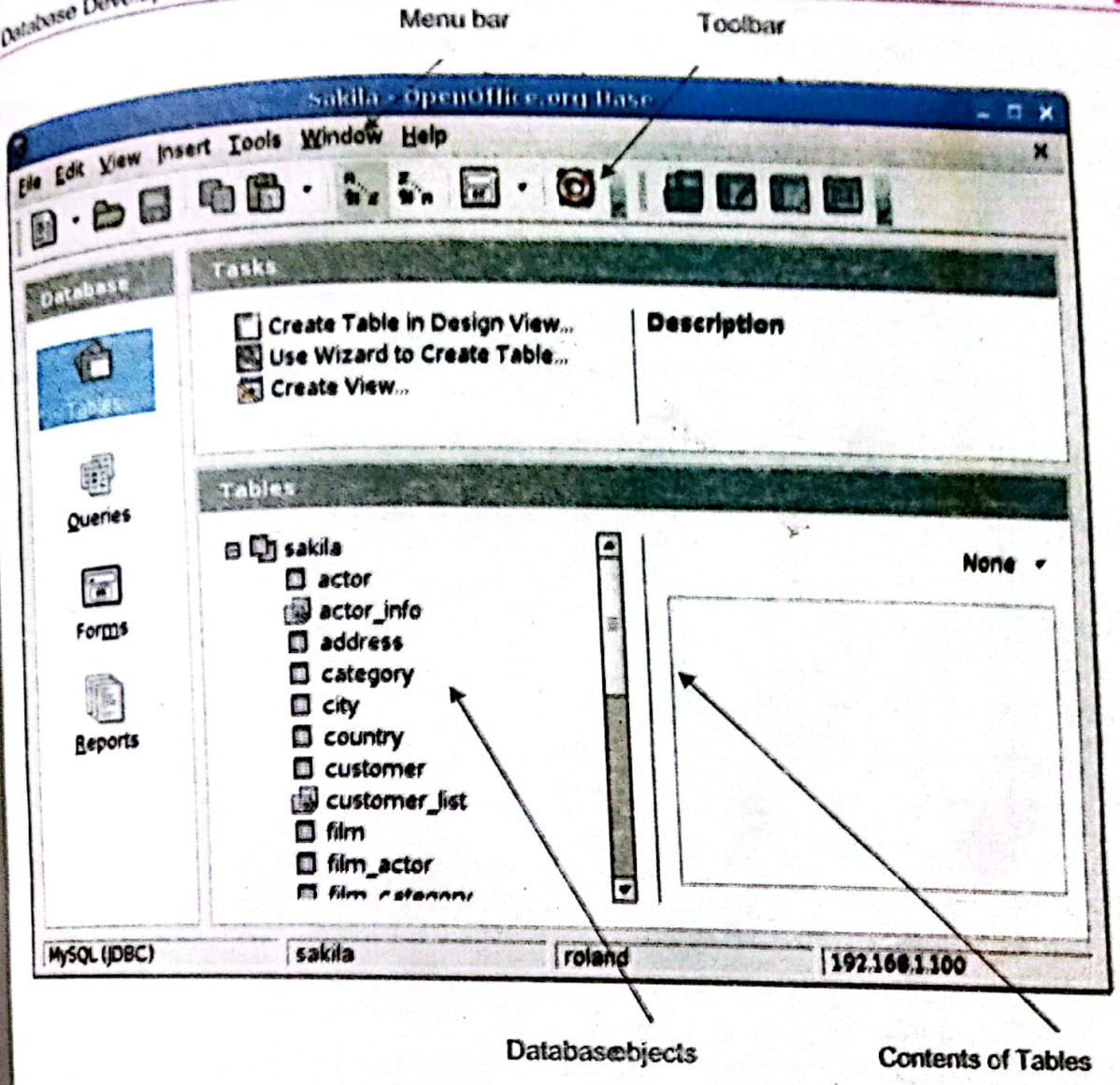

Fig.8.1 OpenOffice Base Database Management System

Microsoft Access

It is one of the popular database software by Microsoft. To understand the basic concepts of database management, Microsoft Access 2007 will be discussed in this book.

Following objects are used in Access for managing a database.

Table: It stores all the data of a database.

Form: It is a window that displays data for viewing, entering and editing information.

Query: It is used to gather information based on one or more criteria.

Report: It is used for printing information from database.

OpenOffice Base

OpenOffice Base is the database module of OpenOffice Suite. It is an open source application program. OpenOffice Base is a fully featured database management system. It

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features wizards to help new users to create database design, that is, to create tables, forms and reports. It allows users to create interactive databases where they can manage related to payroll, inventory, assets, budgets, customers, sales orders and invoices, etc.

The information in OpenOffice databases can be exported to other database programs and also to other OpenOffice programs.

SQL Server

SQL Server is a product of Microsoft Office. It is a relational database management system that offers a variety of tools for database development, maintenance and administration.

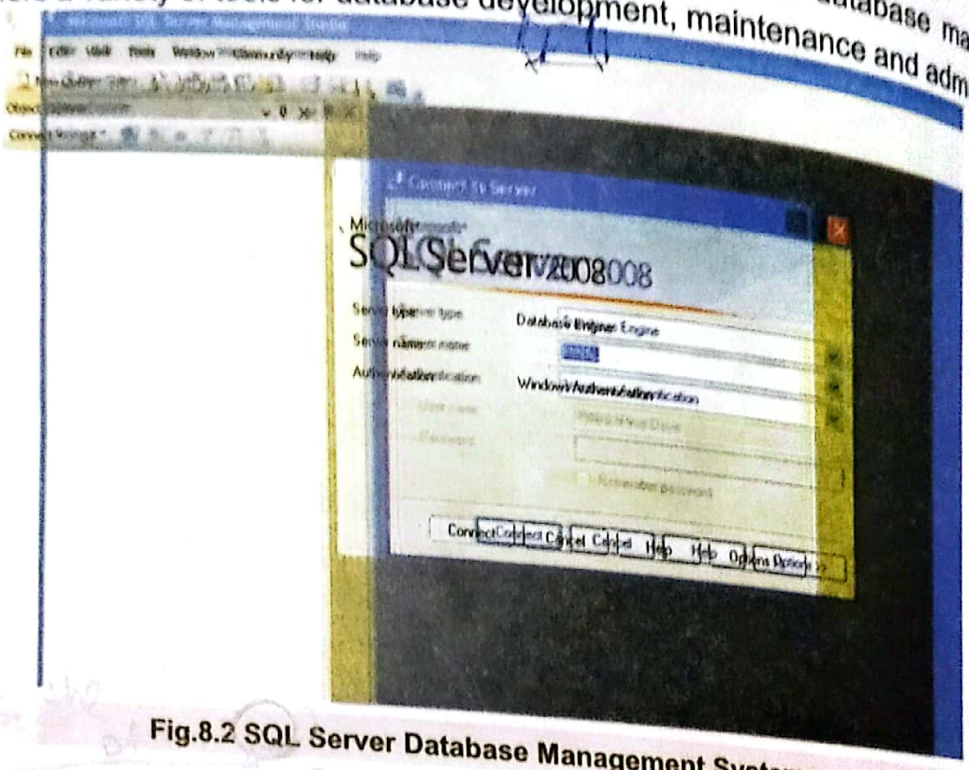

Fig.8.2 SQL Server Database Management System

Its main function is to store and retrieve data as requested by other software applications. It has different versions suitable from small applications for a number of users to big applications for thousands of users. It provides environment to create databases that can be accessed by workstations and other media such as personal digital assistant. It is also used to create and manage Web-based databases.

8.1.2 SELECTING A SUITABLE DBMS

In this book, Microsoft Access 2007 is selected for learning how to create and manage a database. Microsoft Access is popular worldwide and it is most suitable for beginners to learn how to develop and manage a database. It is already installed on many computers when purchased and it is easily available to purchase.

The Access Window

The Access Ribbon located near the top of the Access Window, is the control center of Access as shown in Fig.8.3. The ribbon provides easy way to perform tasks while creating

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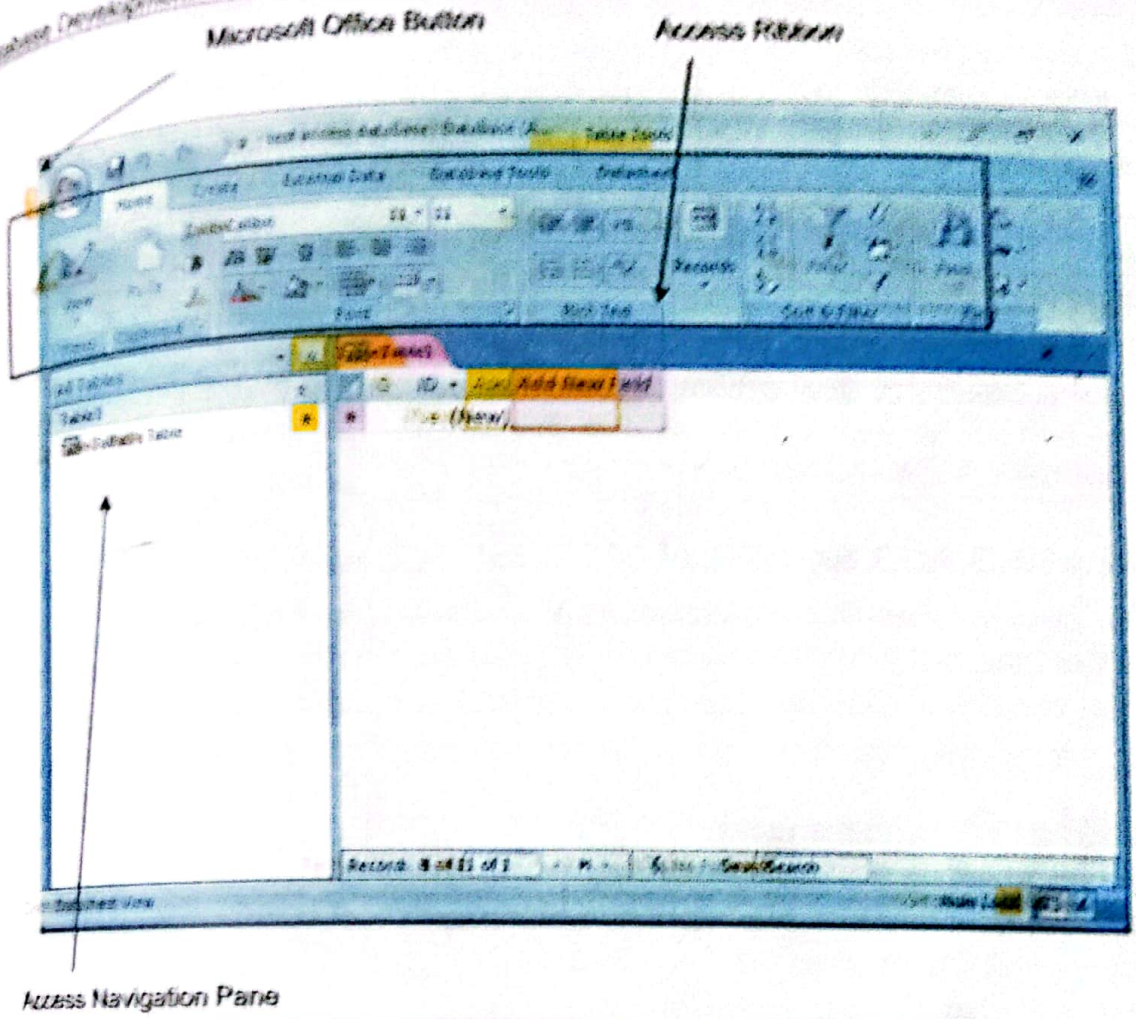

Fig.8.3 Microsoft Access Window

base object. There is a row of ribbon tabs with headings such as Home, Create, External and Database Tools. The Home tab contains the more frequently used commands. Clicking each tab presents you with its own individual ribbon with its own particular icons. Each icon in a ribbon is contained within a group of icons that perform similar tasks. For example, to display the Create tab, click Create on the ribbon. The Create tab has groups for Tables, Forms, Reports and Other.

Microsoft Office Button

The Microsoft Office Button that is shown above is located in the top left corner of the Access Window. You click this button to perform tasks such as saving, opening, new file creation printing, etc. To the right of this button is the Quick Access Toolbar that provides quick access to some more commonly used commands in Access 2007. There are three default icons

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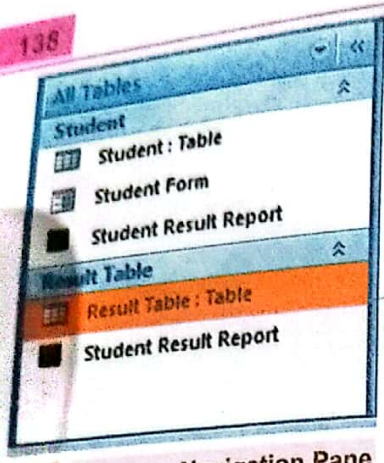

Fig.8.4 Access Navigation Pane

on this toolbar, save, undo, redo, which are very Microsoft Word program. You can customize this toolb additional commands.

Access Navigation Pane

The Access Navigation Pane displays icons for all t forms, queries and reports that you create as shown i When you want to open any database object, you just of these icons and the required object will open in Access window.

8.1.3 CREATING AND SAVING AN ACCESS DATABASE

The first step in creating an Access database is to create a blank database fi done from the Getting Started Window when you run the Access program. The file is one of the folders of your computer which you specify. The procedure for this is describ

Launching Access 2007

1. Click the Start button on the Windows taskbar.
2. Click All Programs on the Start menu.
3. Click Microsoft Office on the All Programs submenu.
4. Click Microsoft Office Access 2007 to launch Access 2007 and display the Gettir with Microsoft Office Access screen shown in Fig.8.5

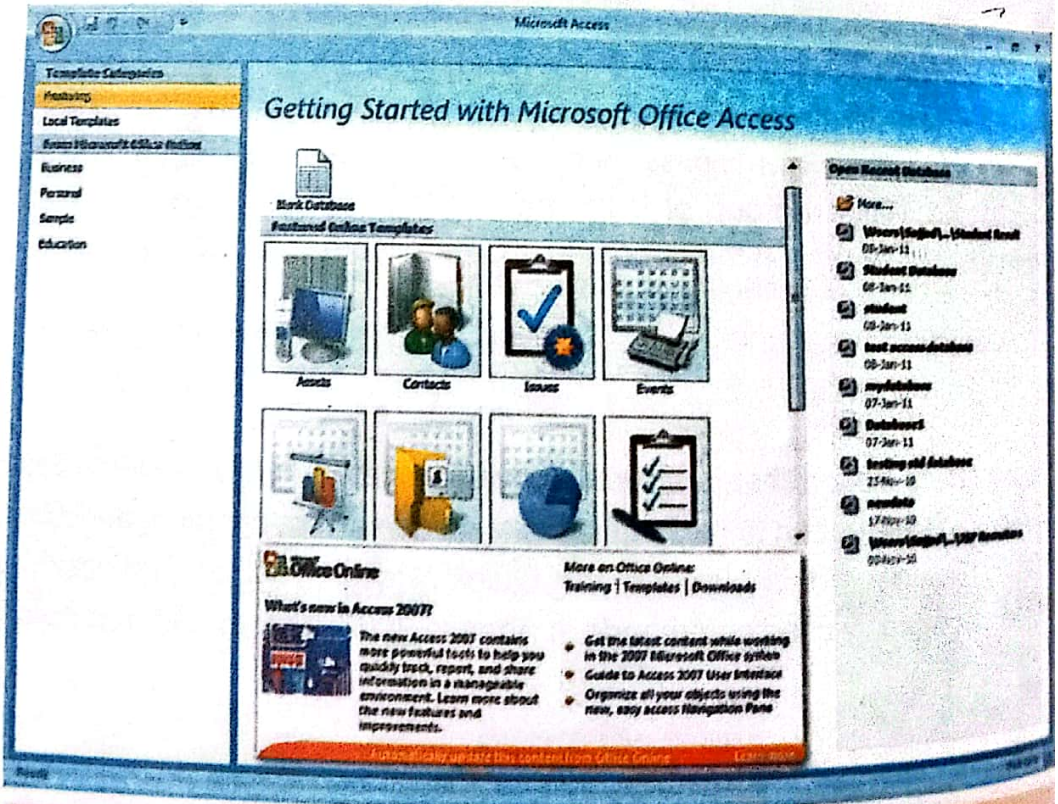

Fig.8.5 The Getting Started with Microsoft Office Access screen

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Select Blank Database Template

This icon is on the top left of the Getting Started with Microsoft Office Access screen. Click the Blank Database icon to bring the Blank Database side bar on the right side of the screen as shown in Fig.8.6.

Enter Filename for your Access Database

1. Enter a file name for database file.
2. Click the folder icon and browse for selecting a location for saving your database.
3. Click the Create button to create and save your database.

The database you just created will open for you to work on.

8.1.4 DATABASE OBJECTS

The following are the main objects used in Access.

Tables: Access stores all the information of a database in one or more tables. Information stored in tables is very similar to the Excel worksheet. Information in tables is organized in rows and columns.

Forms: A form is a window that is used for viewing, modifying or deleting data that is stored in tables and for adding new data.

Queries: Queries are used to gather selected information from a database and organize it either for use in reports or for viewing on screen. A query can combine information from multiple tables.

Reports: Reports are used for printing information from a database. A report can combine data from more than one table.

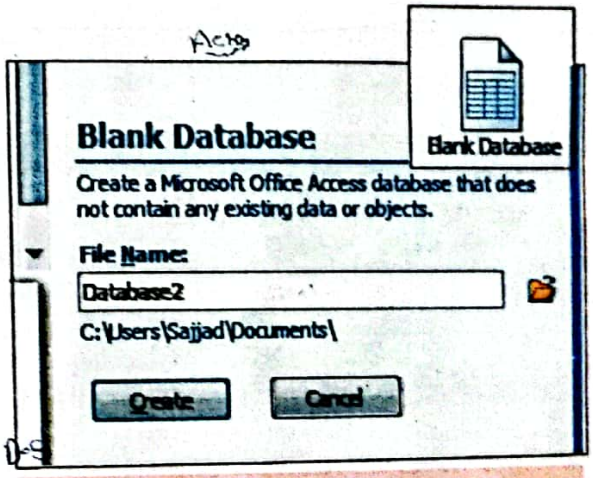

Fig.8.6 Blank Database Side Bar

8.2 WORKING WITH TABLES

Like all the relational databases, Access stores data in tables. Each horizontal row represents a record and each vertical column represents a table field. Each row of table is a record of a particular person, item, product, etc.

8.2.1 CREATING, SAVING AND EDITING A TABLE

We are going to create a Student Database Management System. This database consists of two tables, a form, queries and reports. The two tables are STUDENT table and RESULT table. STUDENT table will store students' particulars and RESULT table will store their results of various examinations throughout the year.

Creating the STUDENT Table

1. Click the Create tab.
2. Click Table Design icon in the Tables group to bring the table design grid shown in Fig.8.7.

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3. Enter STUDENTID below Field Name in the first row as shown in Fig.8.8. This field will contain a unique reference number for each student.
4. Click on the cell below Data Type and select AutoNumber from the drop-down list because we want Access to automatically generate a unique reference number for each student.
5. On the next row enter STD NAME (Student Name) in the column that has the heading Name.
6. Click on the cell on the right side and select Text data type which is default.

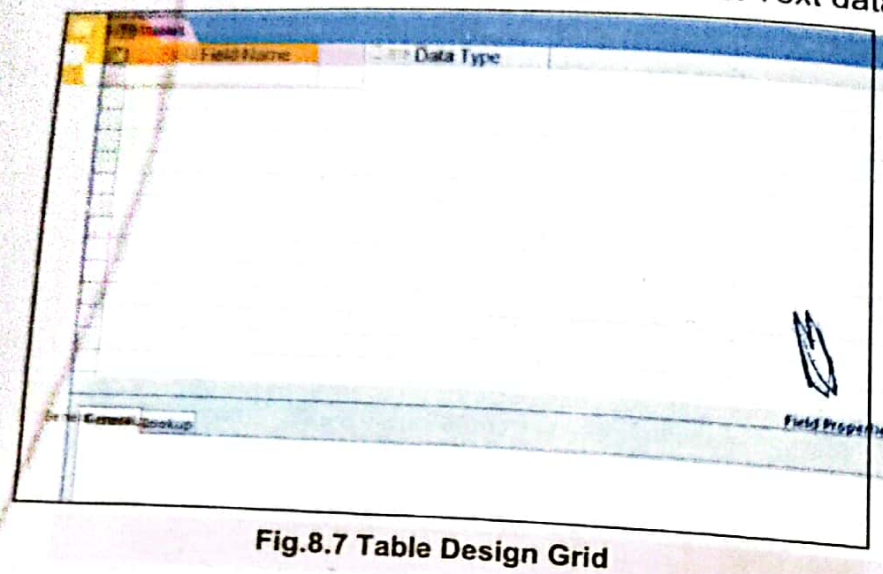

Fig.8.7 Table Design Grid

7. Enter 10 in the cell on the right of Field Size in the Field Properties section to allow maximum characters for a student name.

In a similar manner enter the fields CLASS, DOB (Date of Birth) and CITY. Data type of CLASS is Text of field size 6, data type of DOB is Date/Time. After selecting the Date/Time data type for DOB, click on the cell on the right of Format in the Field Properties section and select General Date from the drop-down list as shown in Fig.8.8. Finally enter the CITY field name with data type Text having field size 10.

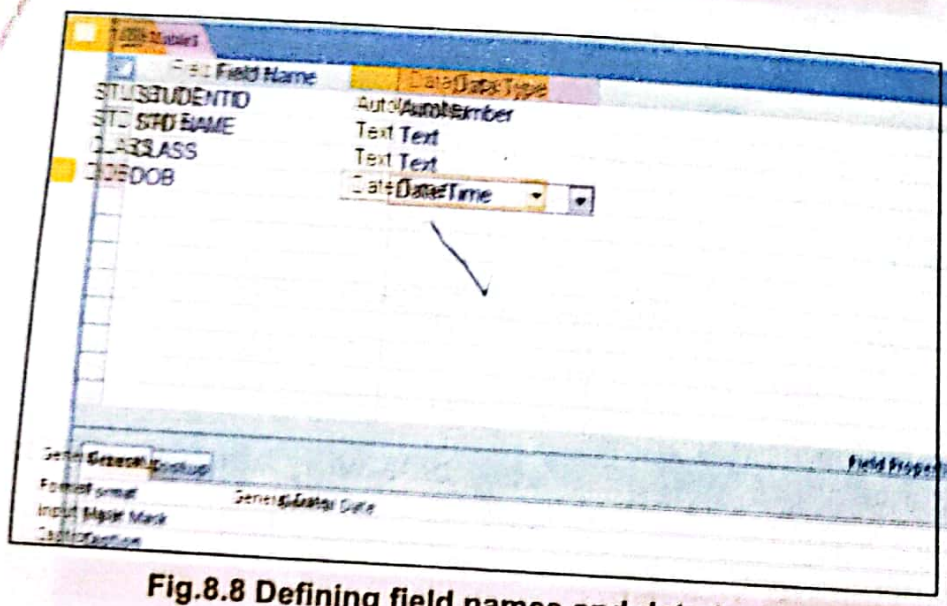

Fig.8.8 Defining field names and data types

Before you save the table, choose the Primary key, which in this case is STUDENTID. To do this:

1. Select STUDENTID row by clicking on it.
2. Click the Primary Key icon in Tools group.
3. Save the table by clicking the save icon on the top left of the screen above the Access Ribbon.
4. Name the table STUDENT in Save As dialog box and click OK.

Now enter data in the table in datasheet view, just like you enter in an Excel worksheet. Double click on the STUDENT table in the Navigation Pane and enter the data in the table as is shown in Fig.8.9.

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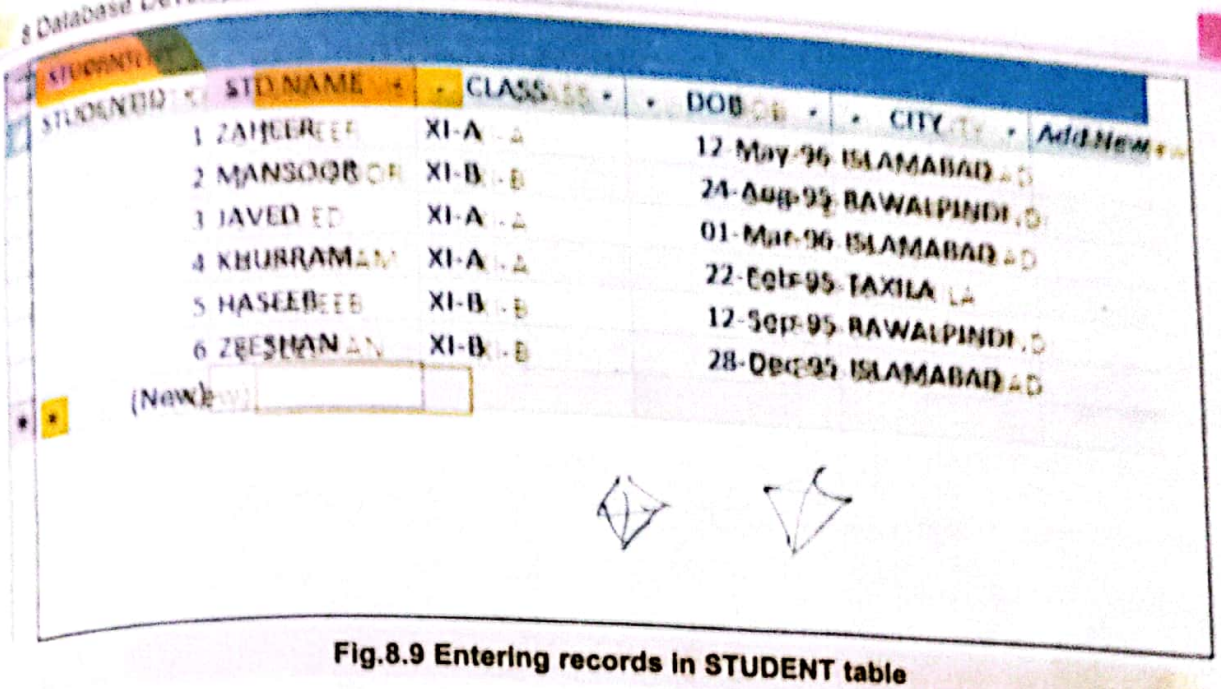

Fig.8.9 Entering records in STUDENT table

1. Click in cell below STD NAME and enter ZAHEER.
2. Press right arrow key to move to CLASS column and enter XI-A.
3. Press right arrow key again and enter 12.5.96 in DOB column.
4. Press right arrow to move to the CITY column and enter ISLAMABAD. The General Date format will be automatically applied to the date which you specified when you created this field.

As soon as data is entered in the STD NAME field of first record, STUDENTID field automatically gets the value 1 and whenever a new record is entered, it is incremented by one. You never have to enter value for this field.

Enter all the 6 records in the student table following the same method. Data in records is automatically saved.

Creating the RESULT Table

Create the RESULT table just as you created the STUDENT table having the fields data types and field size given in Fig.8.10.

Filed Name	Data Type	Field Size
RESULTID	Number	Long Integer
EXAMINATION	Text	10
MATHS	Number	Integer
PHYSICS	Number	Integer
COMPUTER	Number	Integer

Fig.8.10 Fields of RESULT table with their data types

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The first field, RESULTID is a foreign key field and it will be used later to link with the STUDENT table using the STUDENTID primary key. The field size of both STU and RESULTID must be the same which is Long Integer. The second field in EXAM will store the name of the examination such as MID-TERM, FINAL, etc. The last thr MATHS, PHYSICS and COMPUTER will store the marks of these subjects and their is Integer. Integer data type is selected for these fields from the Fields Properties Design View. To select Integer data type click on the cell on the right side of Field Si the drop-down menu and select Integer. If you select Long Integer for these fields, it wi more memory.

Editing the Structure of a Table

User can edit the structure of a table in the Design View. This is shown in Fig.8.11

- In Design View, you can add, insert or delete fields.
- To delete a field, click the selection box on the left side of the field and press the De
- To add a new record, enter the field name below the last field and specify its data ty
- To insert a new field, click the selection box of the field name before which you want the new field and press the Insert key. You can also modify the field names.

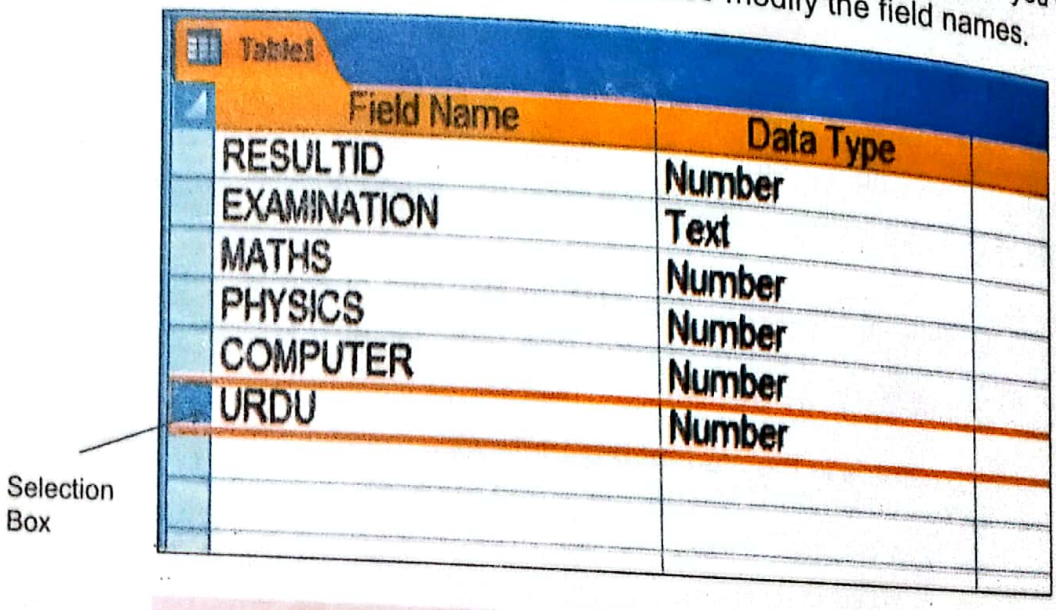

Fig.8.11 Editing structure of table

8.2.2 DATA TYPES IN ACCESS

There are seven types of field data types which are commonly used in Access.

1. Text: Text fields are most common, so Access assigns Text as the default data type field can contain as many as 255 characters and you can designate a maximum length or equal to 255. Access assigns a default length of 50 characters.

2. Memo: Memo fields ordinarily contain as many as 65,535 characters. You use them to descriptive comments. Access displays the contents of Memo fields in a Datasheet memo field cannot be a key field.

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Number: Various numeric data subtypes are available in the Field Properties pane of Table sign window. Choose the appropriate data subtype by selecting one of the Field Size property ings. You specify how to display the number by setting its Format property to one of the mats.

AutoNumber: An AutoNumber field is a numeric (Long Integer) value that Access omatically fills in for each new record you add to a table. Access can increment the oNumber field by 1 for each new record or fill in the field with a randomly generated number, pending on the New Values property setting that you choose. The maximum number of ords in a table that can use the AutoNumber field is slightly more than 2 billion.

Yes/No: Logical fields in Access use -1 for Yes (True) and 0 for No (False). You use the rmat property to display Yes/No fields as Yes or No, True or False, On or Off or -1 or 0.

Currency: Currency is a special fixed format with four decimal places designed to prevent nding errors that would affect accounting operations where the value must match to the ny.

Date/Time: Dates and times are stored in a special fixed format. The date is represented by whole number portion of the Date/Time value and the time is represented by its decimal tion. You control how Access displays dates by selecting one of the Date/Time Format perties.

The other two data types, OLE object and Hyperlink are beyond the scope of this book refore they will not be explained here.

Depending on the specific data type that you choose for a field, you can set additional perties for a table field. You set these additional properties on the General page of the Table sign window's Field Properties pane by selecting from drop-down or combo lists or by typing ues in text boxes.

When you have defined all the fields that you want to include in your table, you must save When you close the Table Design window, it will ask you whether you want to save it or not. ect save and give your table a name. You can also save it by clicking the save icon on the left corner of the screen.

2.3 CREATING PRIMARY KEY AND FOREIGN KEY

After defining all the field names and their data types in Design View, create a primary for table as shown in Fig.8.12.

Select the field name STUDENTID by clicking the selection box on the left side of the field name.

Click the primary key icon on the Tools group of Design tab.

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In our project of Student Database Management System, we are g
RESULTID field the foreign key when we create relationship between the STUDE
the RESULT table.

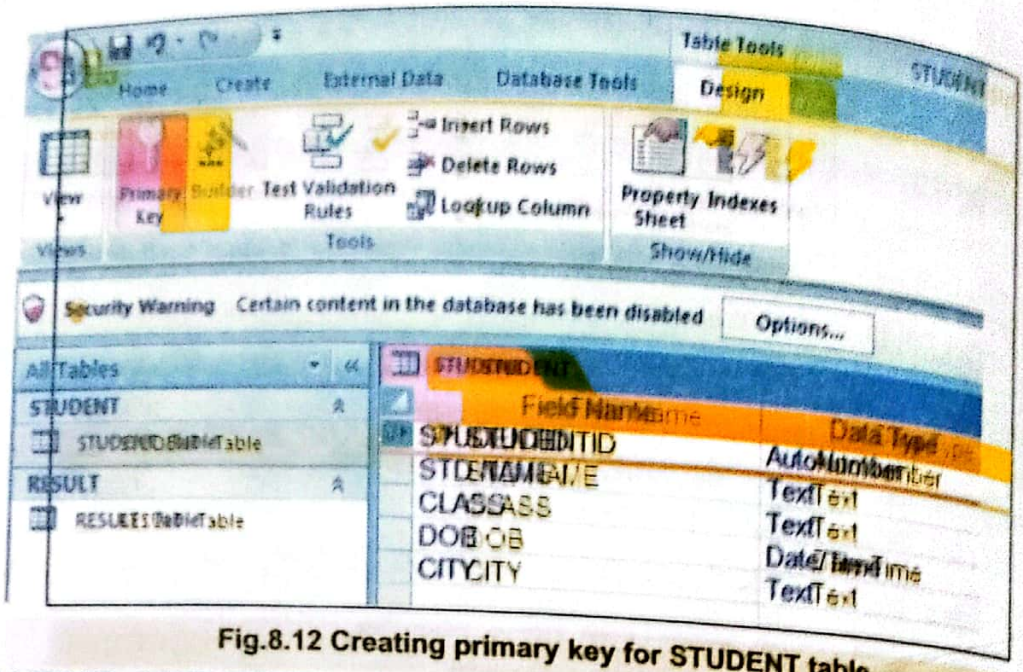

Fig.8.12 Creating primary key for STUDENT table

8.2.4 CREATING AND EDITING RELATIONSHIP BETWEEN TABLES

A database can contain many tables. The reason to put more than one t
database is that it is easier to manage data if all the information about a particular s
its own table. For example, in our Student Database Management System, we have c
tables, one for holding students' particulars and the other for holding their results
examinations throughout the year.

The connection between a field in one table and a field in another table must
within Access. Such a definition is known as a relationship and each of the fields is
related to the other field. Once a relationship has been designated, Access can help yo
the integrity of the related data and can make it easier to access related data. Relation
allow you to create queries, forms and reports that display information from several
once.

Creating Relationship between STUDENT and RESULT Tables

We are going to create a one-to-many relationship between the STUDENT
the RESULT table. This requires that primary key field, STUDENTID of the STUDENT table must have a unique value but the values in the foreign key field, RESULTID can match many entries in the related field of the

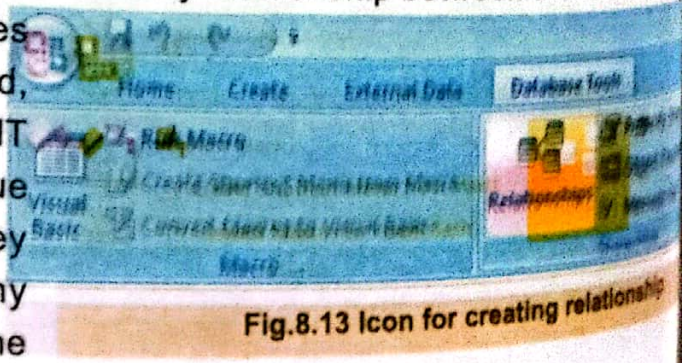

Fig.8.13 Icon for creating relationship

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existing table to represent results of various examinations. Note that the data type for STUDENTID should be AutoNumber and the data type of RESULTID should also be a number but it can have duplicate values.

The steps for creating relationship are given below.

Click the Relationship icon in the ribbon of Database Tools as shown in Fig.8.13

Click the STUDENT table and click the Add button shown in Fig.8.14

Click the RESULT table and click the Add button.

Click the Close button to close the dialog box.

Move the mouse pointer to the primary key STUDENTID and drag it to the foreign key RESULTID in the RESULT table.

Release the mouse button to display the Edit Relationship dialog box shown in Fig.8.15.

Check the Enforce Referential Integrity, Cascade Update Related Fields and Cascade Delete Related Records boxes.

Click the Create button to finish the job.

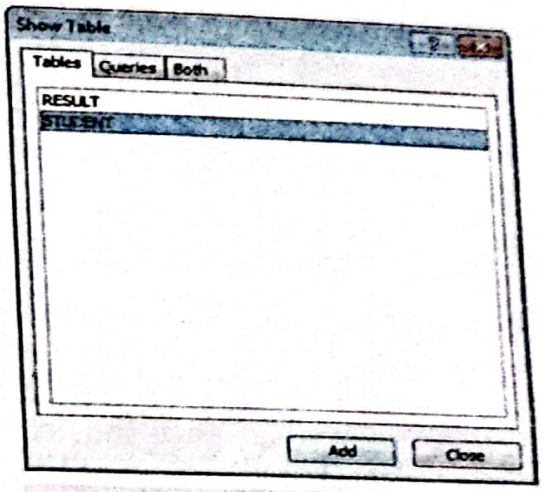

Fig.8.14 Show Table dialog box for adding tables

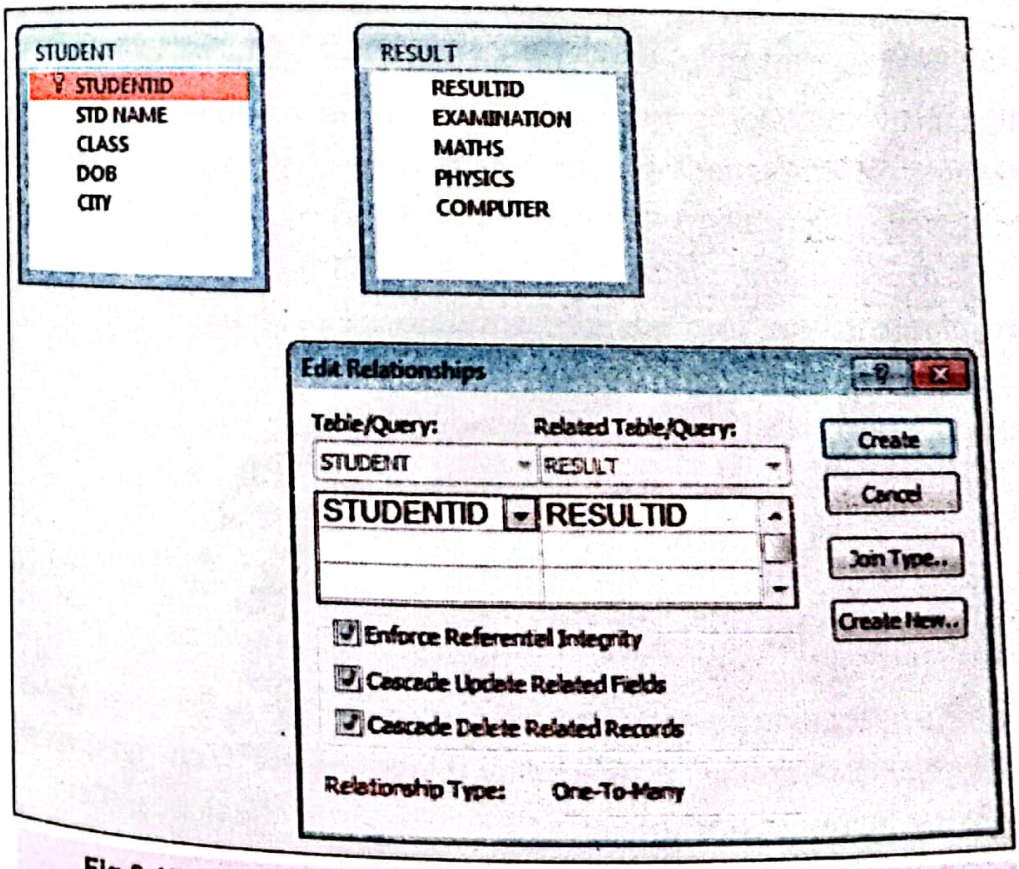

Fig.8.15 Edit Relationship dialog box for creating relationship

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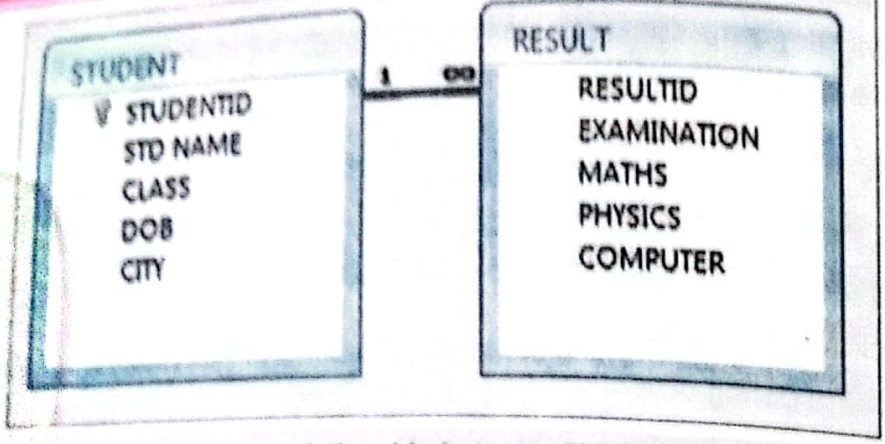

Fig.8.16 One-to-many relationship between STUDENT and RESULT tables

Access sh
relationship between
as a join line conn
related fields as
Fig.8.16. The appear
line indicates the type
have chosen and wh
are forcing referential
The small 1 indicates
on the one side
relationship and the sm
sign indicates the tab

many side of the relationship.

Editing Relationship among Tables

To change relationship between tables, click Relationship in the Database Tools
the join line that connects the fields. When you select the join line, the line becom
Press the Delete key to clear the existing relationship. Click Yes when the message
you to confirm your deletion. Now recreate the relationship by using the procedure
earlier.

Referential Integrity

The capability to enforce referential integrity is an important feature of
Referential integrity enforcement prevents you from deleting or modifying val
primary table's record on which related records depend. If you try to delete a
record from STUDENT table, Access prevents you from doing so. Access di
message box informing you that you must delete all records related to prima
record before you can delete the primary record. You cannot change a valu
STUDENT table's STUDENTID field because the field data type is AutoNumber.
if you attempt to change a RESULTID value in RESULT table to a field that does
in the Student table's STUDENTID field, you get error message again. With r
integrity enforced, Access automatically ensures that the values you enter corre
valid STUDENTID value when you save the new or edited record.

Access 2007's cascading deletion and cascading update options for tables with
referential integrity makes maintaining referential integrity easy. You must mark the
Update Related Fields and Cascade Delete Related Records check boxes and Acces
the work for you.

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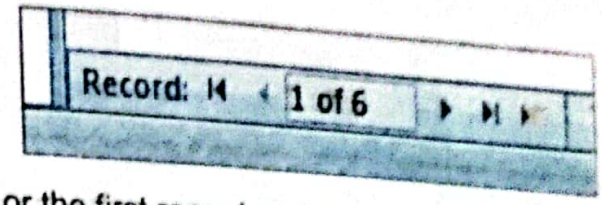
8.2.5 NAVIGATING THROUGH RECORDS IN A TABLE



The navigation buttons of a table are at the bottom left corner. When you click at any field of a record, you can see the record number and the total number of records in the table. The button to the left of the record number will move you to the previous or the first record and the button to the right will move you to the next or the last record in the table. The last button on the right side will allow you to enter a new record. You can also enter a new record by clicking the New icon in the Records group on the Home tab.

8.2.6 ADDING, MODIFYING AND DELETING RECORDS

Adding Records in a Table

The following are the steps for adding new records in a table.

1. Right click on the table in the Navigation Pane in which you want to add new record and select Open option or double click it.
2. Click the New button in the Records group of Home tab or click the new record button in the navigation bar at the bottom left of the screen. This will move the pointer to the first blank row after the last record.
3. Enter the data for the new record.

Adding Records in a Related Table

The following are the steps for adding records in RESULT table which is related with STUDENT table.

1. Open the STUDENT table by double clicking it in the Navigation Pane.
2. Click the "+" symbol at the left end of the first row in STUDENT table.
3. Add data for the related record of RESULT table as shown in Fig.8.17. You can add results of more than one examination in the RESULT table since there is one-to-many relationship between the STUDENT table and the RESULT table.

STUDENT

STUDENTID	STD NAME	CLASS	DOB	CITY
1	ZAHEER	XI-A	12-May-96	ISLAMABAD

EXAMINATIC	MATHS	PHYSICS	COMPUTER

2	MANSOOR	XI-B	24-Aug-95	RAWALPINDI
3	JAVED	XI-A	01-Mar-96	ISLAMABAD
4	KHURRAM	XI-A	22-Feb-95	TAXILA
5	HASEEB	XI-B	12-Sep-95	RAWALPINDI
6	ZEESHAN	XI-B	28-Dec-95	ISLAMABAD
(New)				

Fig.8.17 Adding record in a related table

4. When you click the "+" symbol it changes to "-" symbol. If you click it again, you will return to the STUDENT table and the "-" symbol will change to "+" symbol again.

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Fig.8.18 Modifying a record

For modifying the information in a cell, just click the cell containing the data that to change. Delete or type over the old data and enter the new data. When you are edi you will see a pencil symbol appears on the far left of the table on the row you are shown in Fig.8.18. When you finish editing data in a row and move out of the row, the will be saved automatically and the pencil will disappear.

Deleting Records from a Table

The following are the steps for deleting records from a table.

1. Open the table from which you want to delete record.
2. Select the record you want to delete by clicking its row selector box which is on the of the row.
3. Press the Delete key or choose Delete from the Records option on the Home tab.
4. Click the Yes button to proceed with the deletion in the dialog box that appears.

You can select and delete multiple records by selecting them by clicking the ro and dragging it up or down and then pressing the Delete key.

Once you delete a record and click Yes button to confirm your action, you able to restore the record. You cannot undo a record deletion by choosing Undo Quick Access Toolbar. If you ever want to restore a deleted record you will have to from the scratch.

One or more columns of a table can be deleted in a similar way as deleting reco in mind the distinction between deleting a row (record) which is all the fields of informa a single entry and deleting a column for every record in the table. It is generally easier a record than a field for all the records.

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When a record in a table is deleted that is related to another table, Access might need to e one or more records in the related table to enforce referential integrity. Before doing so, display a message. At this point, you must determine whether you want Access to delete additional records which you cannot currently see.

8.3 WORKING WITH FORMS

Access forms create the user interface to your table. Although you can use datasheet to perform many of the same functions as forms, forms offer the advantage of presenting in an organized and attractive manner. A form is a tool that makes it easy to view, modify elete information stored in one or more tables in a database. You can also add new records g a form. You can arrange the location of fields on a form so that data entry or editing rations for a single record follow a left-to-right, top-to-bottom sequence.

A form is constructed from a collection of individual design elements called controls or trol objects. Controls include text boxes, labels and frames. Controls are the components see in the windows and dialog boxes of Access and other Windows applications. You text boxes to enter and edit data, labels to hold field names and object frames to display phics. You can use different ways of creating forms by selecting various options in the ms group which is on the Create tab of Access ribbon. We will use the Form Wizard to ate a form.

8.3.1 CREATING, SAVING AND EDITING A FORM

The following are the steps for creating form from for the STUDENT table using rm Wizard.

Click the Create tab on the Access Ribbon as shown in Fig.8.19

Select More Forms from the Forms group.

Select Form Wizard from the drop-down list.

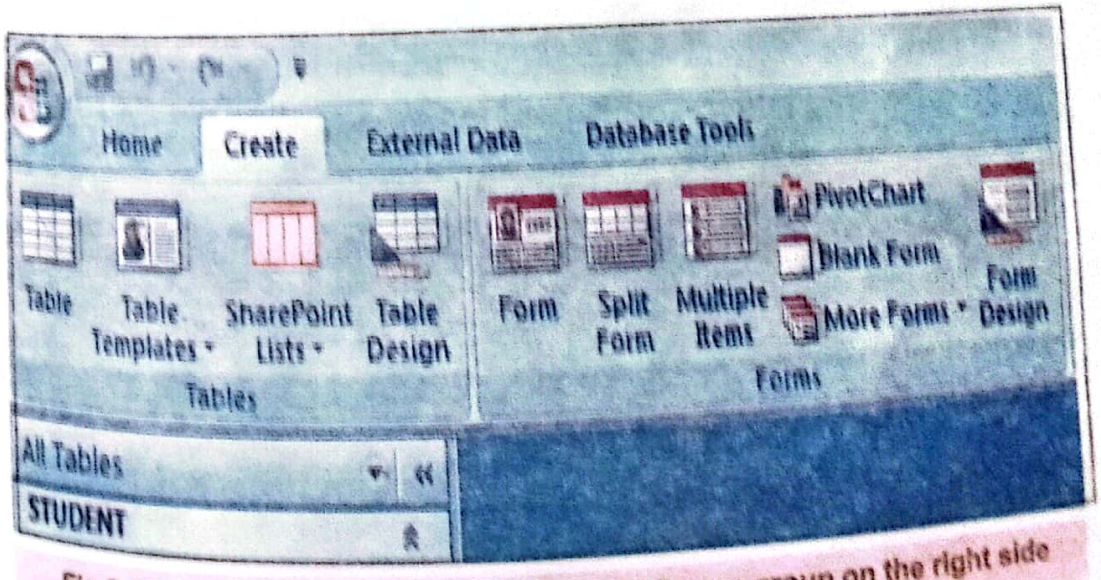

Fig.8.19 Access ribbon showing icons of Forms group on the right side

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4. In the Form Wizard dialog box shown is Fig.8.20, select the STUDENT table in Tables/Queries list box.

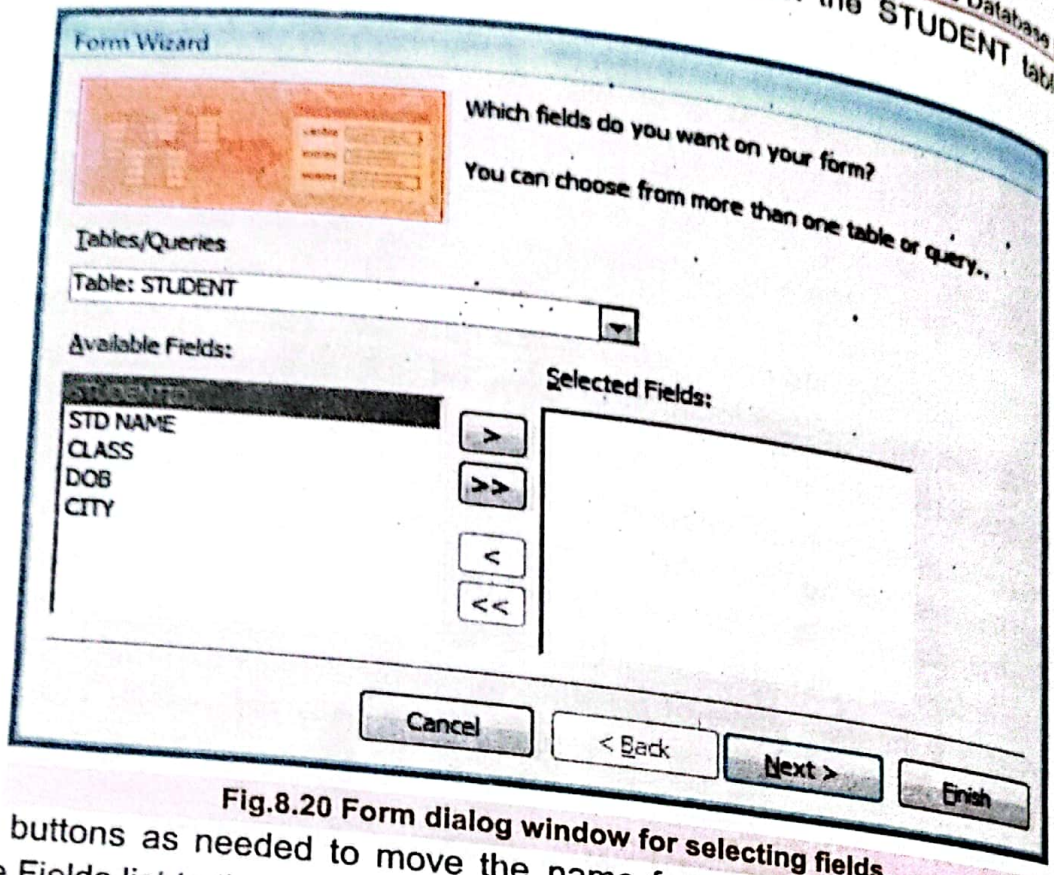

Fig.8.20 Form dialog window for selecting fields

5. Use the buttons as needed to move the name for each of the fields you want from Available Fields list to the Selected Fields list. We will click this symbols for selecting the

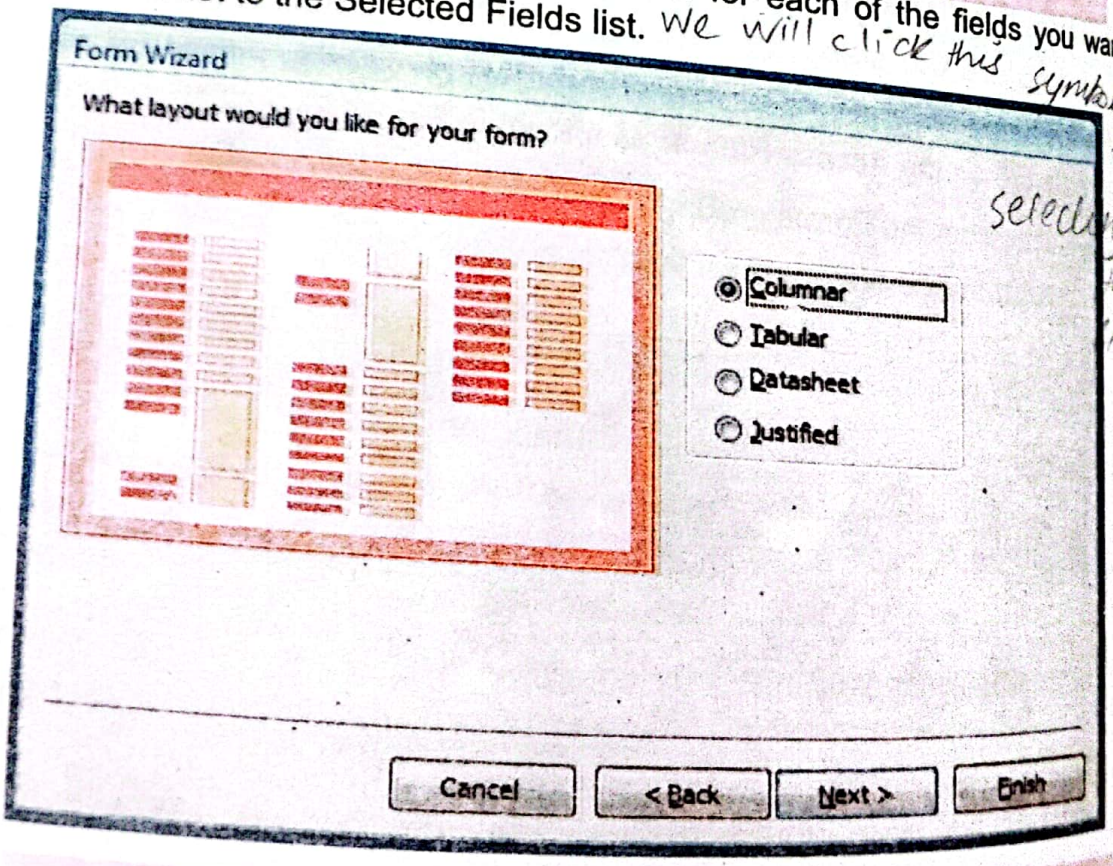

Fig.8.21 Form dialog box for selecting layout

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Database Development

Click the Next button to display the second Form Wizard dialog box shown in Fig. 8.21.

Select columnar layout for your form and click Next to open the dialog box shown in Fig.8.22 for selecting form style.

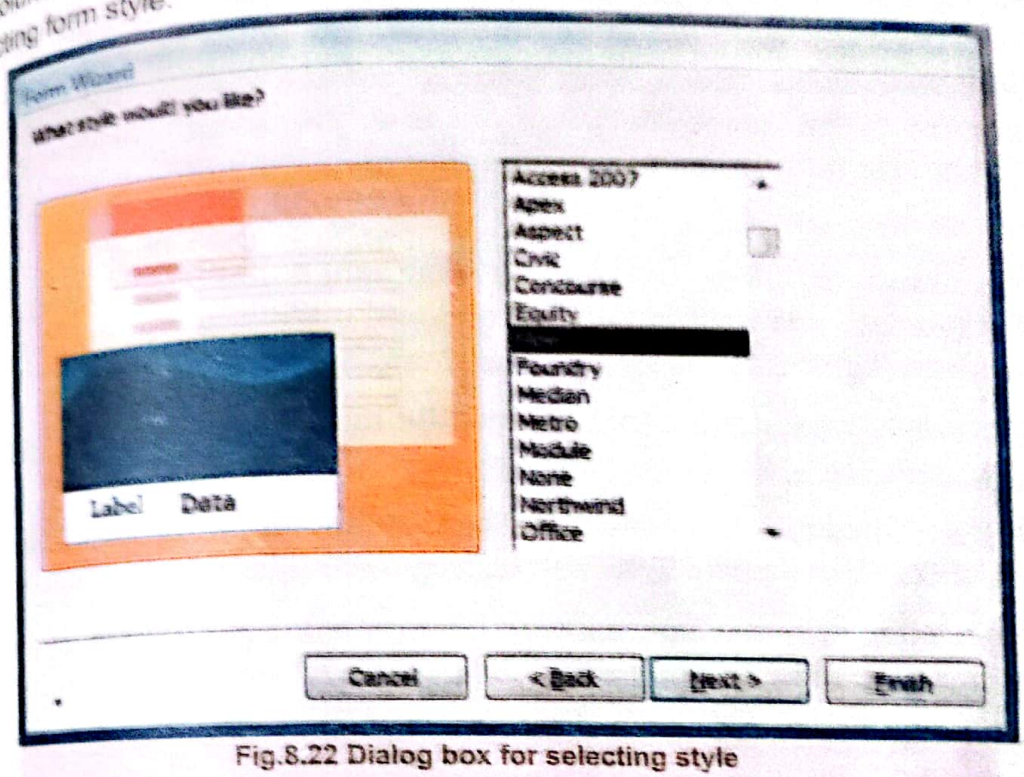

Fig.8.22 Dialog box for selecting style

Select a form style and click Next button to open the final dialog box shown in Fig.8.23.

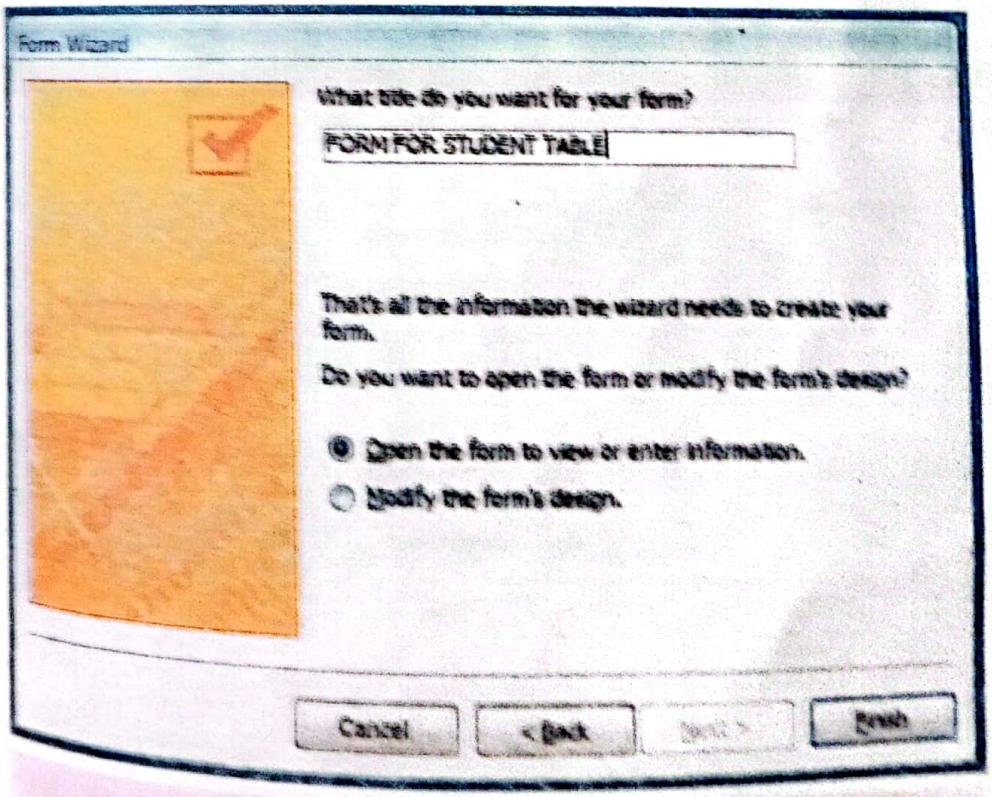

Fig.8.23 Dialog box for naming the form

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Application Development

...the Next button to display the second Form Wizard dialog box shown in Fig. 8.21.

...column layout for your form and click Next to open the dialog box shown in Fig.8.22

...existing form style.

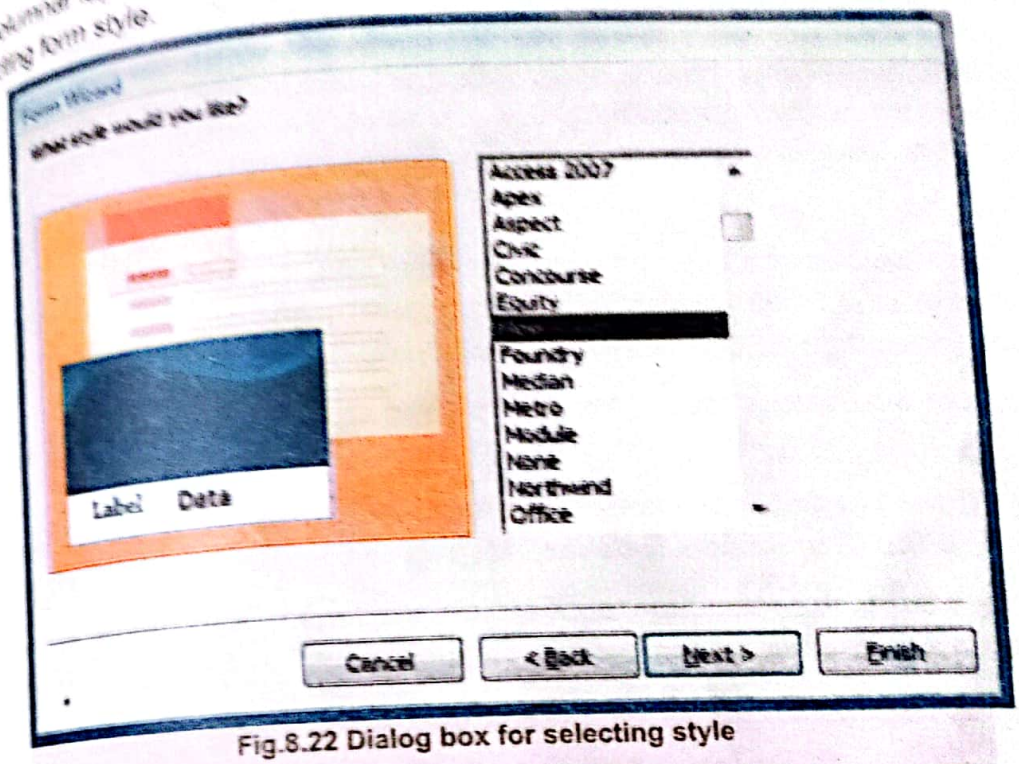

Fig.8.22 Dialog box for selecting style

Select a form style and click Next button to open the final dialog box shown in Fig.8.23.

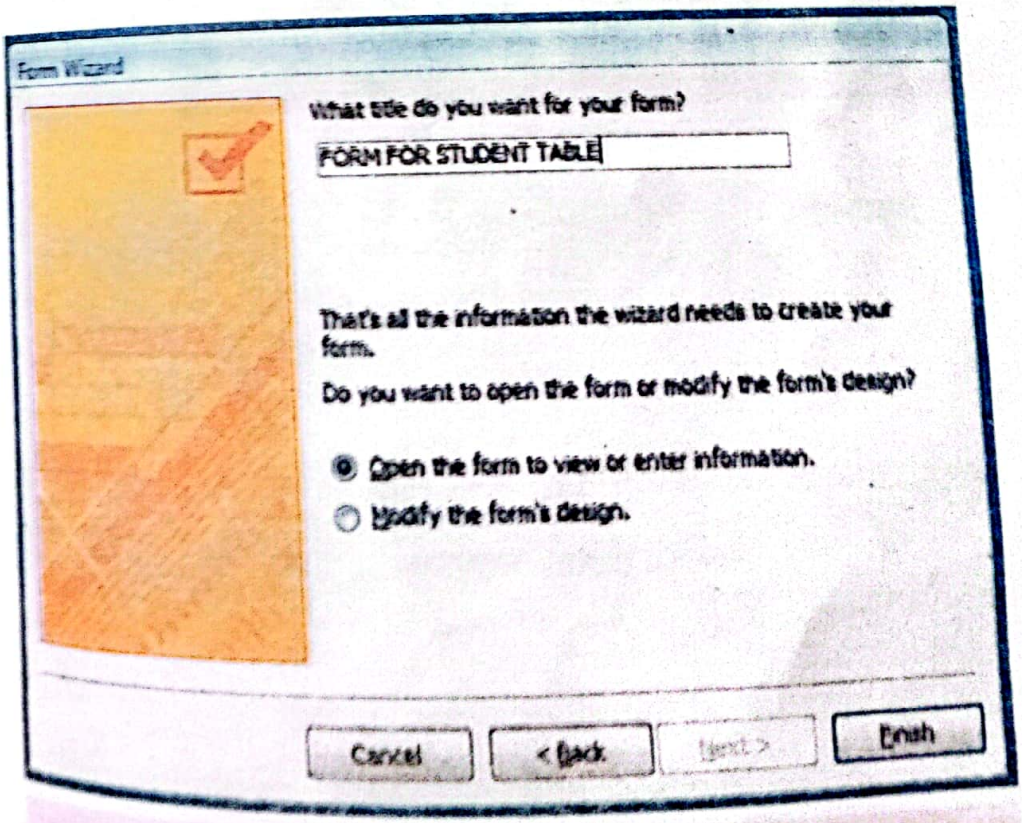

Fig.8.23 Dialog box for naming the form

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Enter a title for your form and select one of the opening options to open the form is saved and click the Finish button to save the form.

The final dialog box in the Form Wizard lets you assign a title to the form and cho way the form is initially opened. If you select the first opening option, the form will be op Form view (or Datasheet view if you selected Datasheet view layout) so that you can imm begin using the form to view or modify data. If you select the second opening option, t will open in Design view so that you can modify its design.

Creating Form for Related Tables

Very often we need to view data from or enter data in related tables or queries same time. For example, you want to view the students' particulars from the STUDEN and their results from the RESULT table in a single form.

To achieve this Access provides subforms. We are going to create such a form Form Wizard.

Following are the steps for creating the form shown in Fig.8.24 for the related STUDENT and RESULT, in Student Database Management System.

1. On the Create tab of Access ribbon, click More Forms in the Forms group and sele Wizard from the drop-down list.
2. Select the STUDENT table in the Tables/Queries drop down list in the first dialog bo

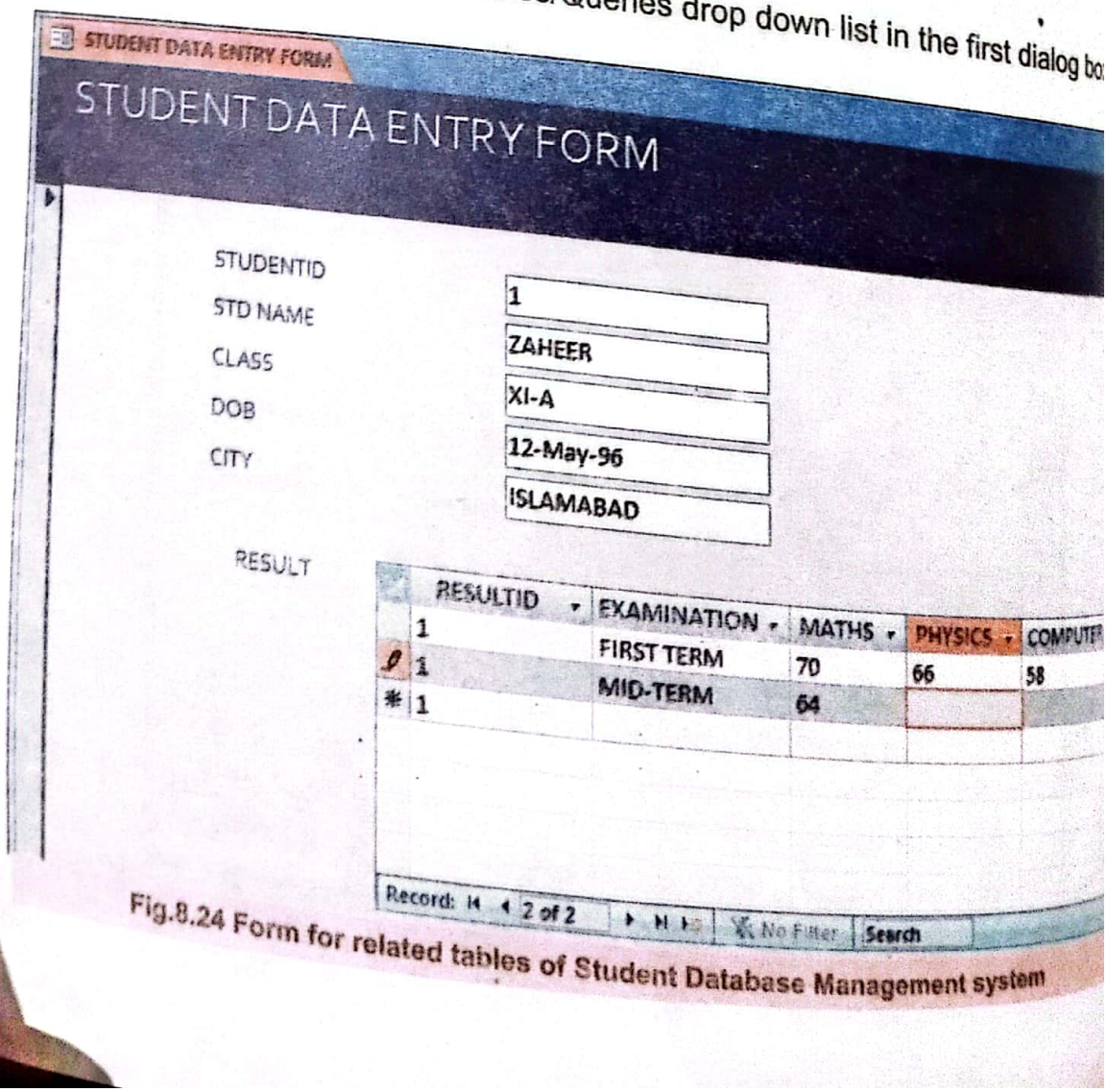

Fig.8.24 Form for related tables of Student Database Management system

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Move all the fields of STUDENT table from the Available Fields list to the Selected Fields list using the buttons.
In the same dialog box, select the RESULT table also and move all the fields to the Selected Fields list to see them in the subform and click the Next button.
The wizard will ask you how you want to view your data. Select by STUDENT and also select Form with subform(s) which is the default choice and click the Next button.
Select the Datasheet layout for your subform and click the Next button.
Select a style that you like and click the Next button.
Type the title STUDENT DATA ENTRY FORM for the form and RESULT for the subform and click Finish button to save it.

8.2 DIFFERENT FORM VIEWS

There are three basic types of forms depending on the layout. These are columnar, tabular and datasheet forms. We select the type of form in the Form Wizard dialog box when we specify the layout as shown in Fig.8.25. When we select the form type in the dialog box, the window on the left shows its layout.

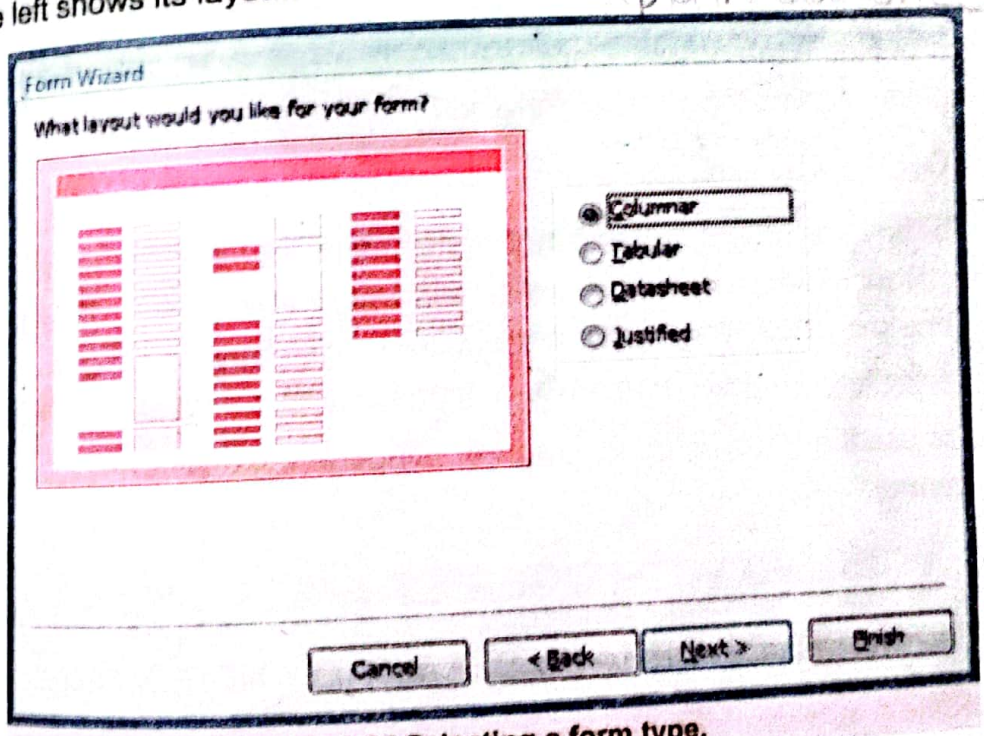

Fig.8.25 Selecting a form type.

8.3 NAVIGATING THROUGH RECORDS IN A FORM

A small toolbar is permanently placed in the lower left corner of the form window shown in Fig.8.26. This toolbar will help you to navigate through the existing records to add new records. To view a specific record, click the empty box in the centre of the bar in the bottom left corner and type the record number and press Enter. You can so use the Find option in the ribbon of Home tab to go to a record that contains specific in one of its fields.

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8.3.4 USING FORM TO ADD, MODIFY AND DELETE RECORDS

Adding new record

To create a new record, click the New Record button that contains the asterisk toolbar at the bottom of the form window the New Record button in the Records gr Home tab. The new record will be added end of the table and will be displayed in th window so that you can enter information

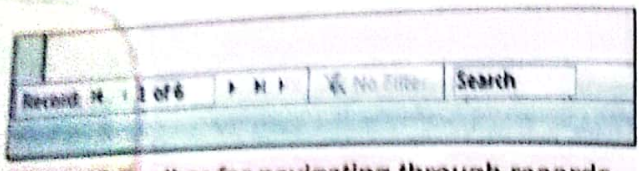

Fig.8.26 Toolbar for navigating through records

Modifying record

To modify data of a record in a form, first display that record on the screen usi navigation toolbar and then just click the text box control and enter the new data. As so you leave that record data is automatically saved.

Deleting record

To delete a record, first display it in the form window and then choose Delete Recor the Records group of Home tab ribbon. Once you delete a record the data is permanent and it cannot be restored using the Undo command.

8.3.5 USING FORM CONTROLS

You can click any text box control and modify the information in a form. You can use Enter key to move through the controls in a form. If you want to enter information into the te controls of a form in a sequence, activate the first control by clicking it and then press Tab o to move to each subsequent control. To move back to the previous control press Shift+Tab.

You can also use the Undo by clicking the Undo button to reverse any changes you to the value in a control.

8.4 WORKING WITH QUERIES AND COMMANDS

8.4.1 DIFFERENT WAYS OF CREATING, SAVING AND EDITING QUERIE

You can create a large variety of queries in Access. You will learn the basics of cr queries using Query Wizard and Query Design. These two methods for creating queri given in the other group of Create tab of Access ribbon.

8.4.2 CREATING QUERIES

Creating a query using Query Wizard

We are going to create a query that will display the STUDENTID NAME and CLASS fields of STUDENT table. The following are the st create this query.

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Click the Create tab.

Click Query Wizard in the Other group and select Simple Query Wizard from New Query window shown in Fig.8.27.

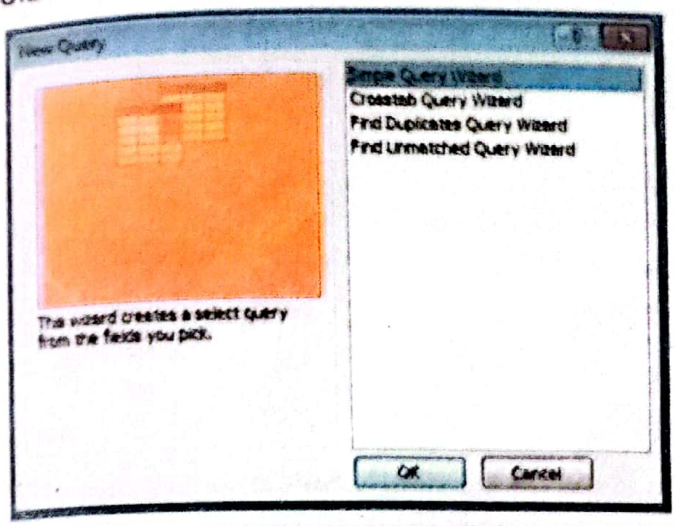

Fig.8.27 New Query window

Select the STUDENT table from the Tables/Queries drop-down list.

Move the fields STUDENTID, STD NAME and CLASS from the Available Fields list shown in Fig.8.28, to the Selected Fields list and click Next.

Enter the title STUDENT NAME AND CLASS for the query and click Finish.

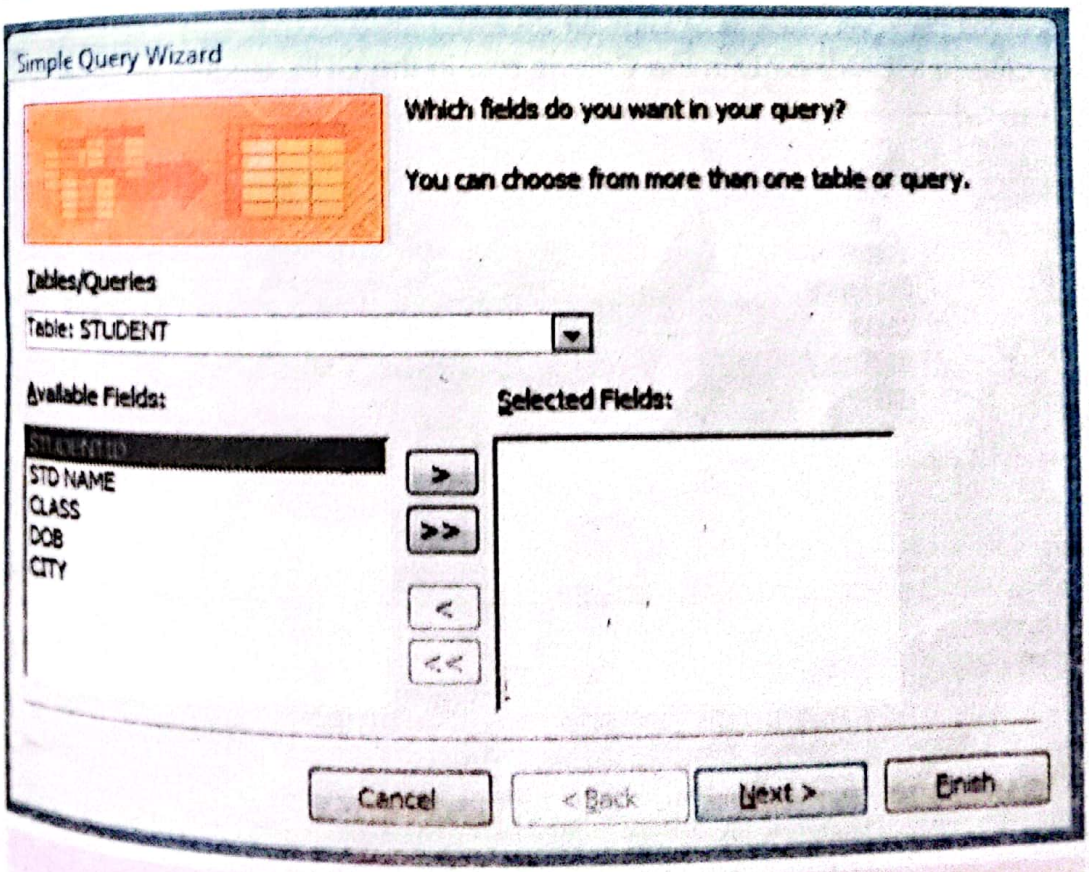

Fig.8.28 Selecting fields in Simple Query Wizard

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6. The fields that you have selected will be displayed in datasheet view.
7. Close the query when you have finished. Access will automatically save the query you can reopen it later.

Creating Queries using Query Design

In this section we are going to create the following five types of queries which are commonly used in databases.

- Select Query
- Update Query
- Delete Query
- Append Query
- Make Table Query

Creating a Select Query

The following are the steps for creating a Select Query that will display all the records from STUDENT table in which the CITY field is ISLAMABAD.

1. Click the Create tab.
2. Click the Query Design icon in the Other group to bring up the query design window.
3. Add the STUDENT table and close the Show Table window.
4. Double click all the fields one by one in the box labeled STUDENT above the query grid. The field names will appear at the top of each column in the query design grid.
5. Enter the criteria ISLAMABAD in the Criteria row in the CITY column as shown in Fig.

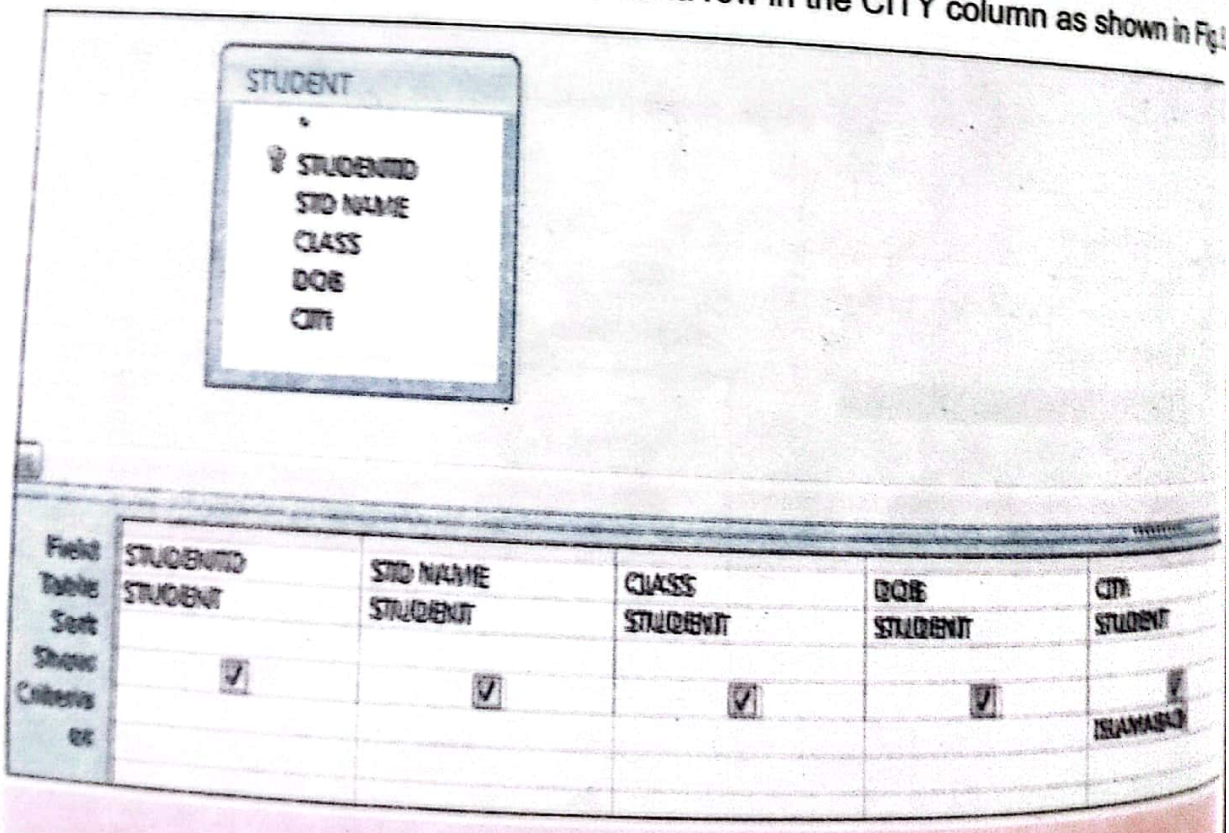

Fig.8.29

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Click the Save icon above the Access ribbon to save the query. When you are prompted for the query name, enter STUDENTS LIVING IN ISLAMABAD and click OK.

To run the query, click the query name in the Navigation Pane on the left side of the screen. You will see a datasheet displaying records of all the students who live in Islamabad as shown in Fig.8.30. You can also run the query without saving it. After creating the select query, click Run in the Results group of Design tab on Access Ribbon.

Students Living in Islamabad

STUDENTID	STD NAME	CLASS	DOB	CITY
	ZAHEER	XI-A	12-May-96	ISLAMABAD
3	JAVED	XI-A	01-Mar-96	ISLAMABAD
6	ZEESHAN	XI-B	22-Dec-95	ISLAMABAD
	(New)			

Fig.8.30 List of students living in Islamabad

Creating an Update Query

Update queries are used to change, add or delete data in existing records. You cannot use an update query to add records to or delete records from a table but you use it to change existing null values to non-null values and non-null values to null values.

We are going to create an update query that will update the CITY field of all the records that have the data ISLAMABAD in the STUDENT table to LAHORE. The easiest way to create an update query is to first create a select query and then convert it into an update query.

The following are the steps to create update query.

1. First create the select query with the criteria ISLAMABAD in the CITY column.
2. On the Design tab in the Query Type group as shown in Fig.8.31 click Update.

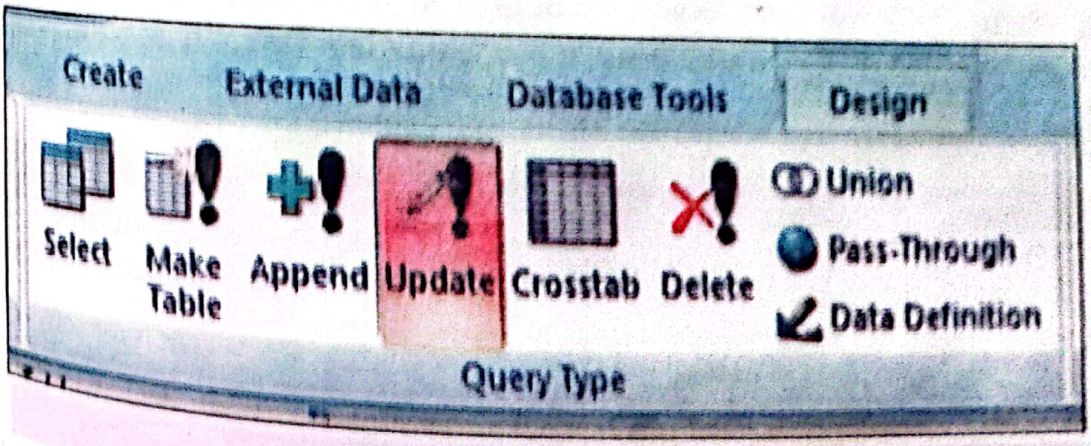

Fig.8.31

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3. Access will add the Update To row in the query design grid as shown in Fig.8
   LAHORE in the CITY column in the Update To row.
4. Click the Save icon on the top left corner of the screen.
5. Type a name for the query and click OK.
6. Double click the query in the Navigation Pane to see the result.

Field:	STUDENTID	STD NAME	CLASS	DOB	CITY
Table:	STUDENT	STUDENT	STUDENT	STUDENT	STUDENT
Update To:					"LAHORE"
Criteria:					"ISLAMABAD"
or:					

Fig. 8.32 Query Design grid for creating Update Query

Creating a Delete Query

Delete queries are used to delete entire records from tables along with the prim
The process of creating a delete query using query design window is very similar to
update query. To do this, first create a select query to select the records that you want
and then convert it into a delete query.

Suppose in our Student Database Management System we want to delete records o
students of class XI-B.

The following are the steps to create this query.

1. First create the select query with the criteria XI-B in the CITY column.
2. On the Design tab in the Query Type group shown in Fig.8.33, click Delete. This will
   Show row in the lower section of the design grid and add the Delete row.
3. To delete the selected records, click Run in the Results group of Design tab. Access
   you to confirm your action, click Yes to confirm.

To delete related data in tables, determine which records are on the "one" sid
relationship and which on the "many" side. If you want to delete records on the "one" sid

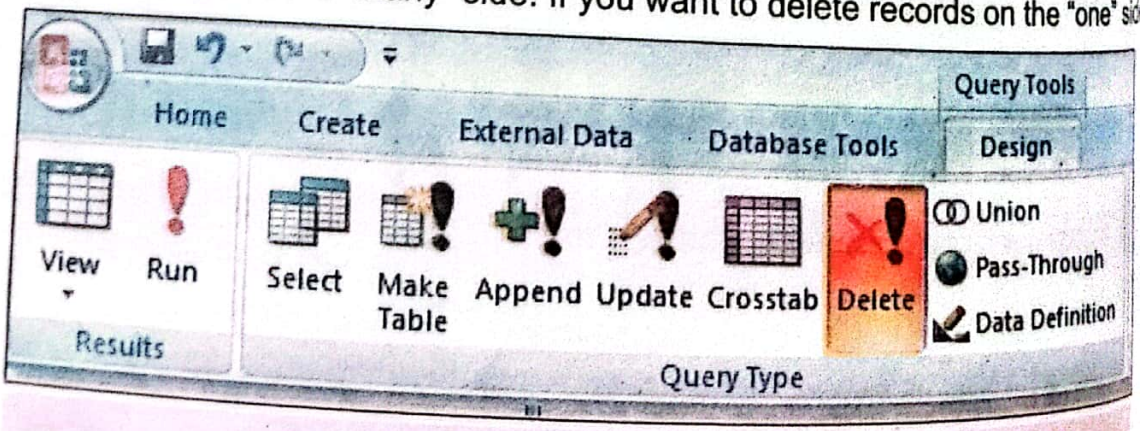

Fig.8.33 Creating a delete query

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lationship and the records on the "many" side, you must enable Referential Integrity and scading delete. If you need to delete records only on the "one" side of the relationship, you t delete that relationship and then delete the data. If you need to delete records only on the ny side of the relationship, you can create and run your delete query without having to change e relationship.

reating an Append Query

Append query is used to add records from a more source table to a destination table. ey often, the source and destination tables are in the same database. Append queries are ot used to change the data in individual fields in existing tables. For this we use update uery. When appending records in table, make sure that the data types you set for the fields n the source table are compatible with the data types that you set for the table fields in the estination table.

An easy way to create an append query is first create the select query and then convert into an append query as we did for creating an update and delete query.

The following are the steps to create an append query to append records of students of any section of class XII to a table in another database.

. Open the database that contains the records that you want to append.

. Click the Create tab and click Query Design to bring up the query design window.

. Select the table that contains the records that you want to append and click Add and then click Close.

. Double click the fields that you want to append so that they appear in the Field row on the design grid.

. Enter the criteria Like "XII-?" in CLASS column as shown in Fig.8.34 The criteria will find all the records that contain a 5 letter string in which the first 4 letters are "XII-" and the last letter is unknown for any section of class XII.

Field:	STUDENTID	STUDENT NAME	CLASS	DOB
Table:	STUDENT	STUDENT	STUDENT	STUDENT
Sort:				
Show:	☑	☑	☑	☑
Criteria:			Like "XII-?"	
or:				

Fig.8.34 Query design grid showing append criteria

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7. Click Append in the Query Type group of Design tab shown in Fig.8.35.

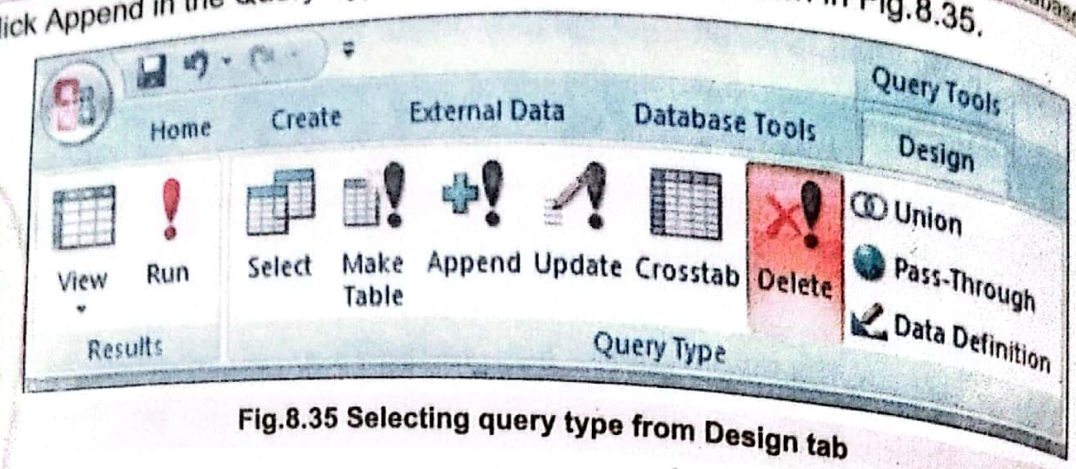

Fig.8.35 Selecting query type from Design tab

8. The Append dialog box shown in Fig.8.36 will appear. Enter the table name in wh want to append the records. Choose to append records to another database and e file name and then click the OK button.

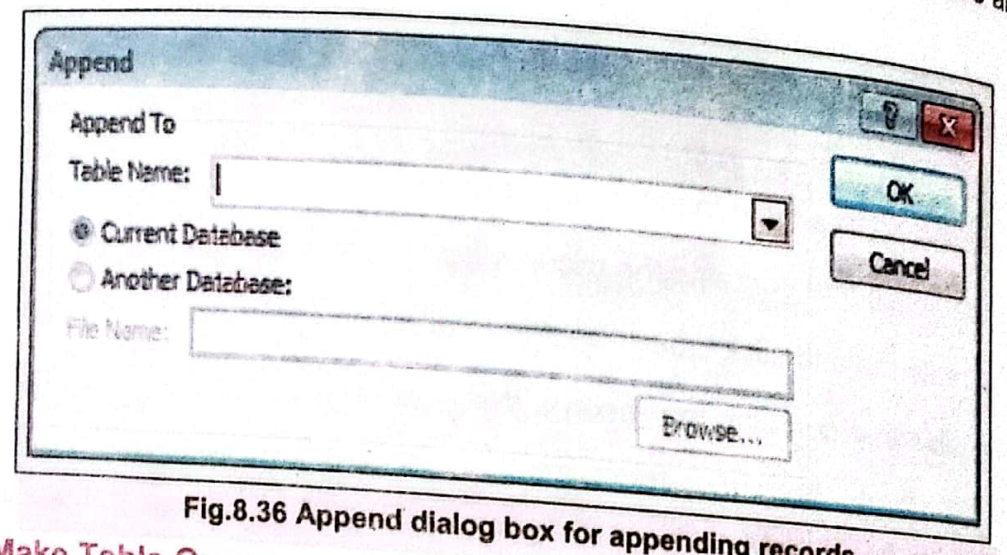

Fig.8.36 Append dialog box for appending records.

Creating a Make Table Query

A make table query retrieves records from a table and copies them into a new The new table can be in the database that you have open or you can create it in a database. To create a make table query, first create a select query and then conver a make table query. Choose a location for the new table and then run the query to the new table.

The following are the steps to copy all the records of students having th ISLAMABAD in the CITY column of STUDENT table.

1. First create a select query that has the criteria ISLAMABAD in the CITY field colum query design grid.

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Click Make Table in the Query Type group of Design tab. The Make Table dialog box will appear as shown in Fig.8.37.

If you want to place the new table in the current database, select Current Database otherwise select Another Database and enter the location and the file name of the other database.

Click OK.

Click Run in the Results group of Design tab.

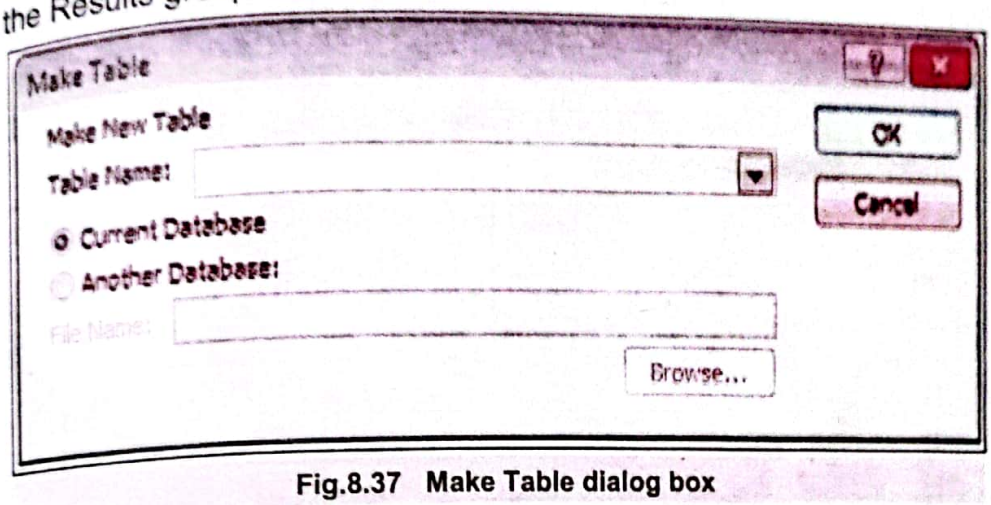

Fig.8.37 Make Table dialog box

8.5 GENERATING REPORTS

The final product of most database applications is a report. Access combines data in bles and queries to produce a report that you can print and distribute to people who need or quest it. Reports provide means for creating printed copies of the information in your database. me reports consist of a single page, such as, order acknowledgement and invoice. Multi-page cess reports are more common than the single-page reports. These reports include catalogs, neral ledgers, financial statements and examination result sheets.

5.1 CREATING A SIMPLE REPORT USING REPORT WIZARD

We are going to create a simple report that will display all the fields of STUDENT table in scending order by name and having portrait orientation.

Following are the steps to create the report.

1. Click the Create tab in the Access ribbon
2. Click Report Wizard icon in the Reports group shown in Fig.8.38.

Fig.8.38 Running Report Wizard from Reports group

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3. Select STUDENT table in the Tables/Queries drop-down list.
4. Move all the fields from Available Fields list shown in Fig.8.39 to the Selected Fields

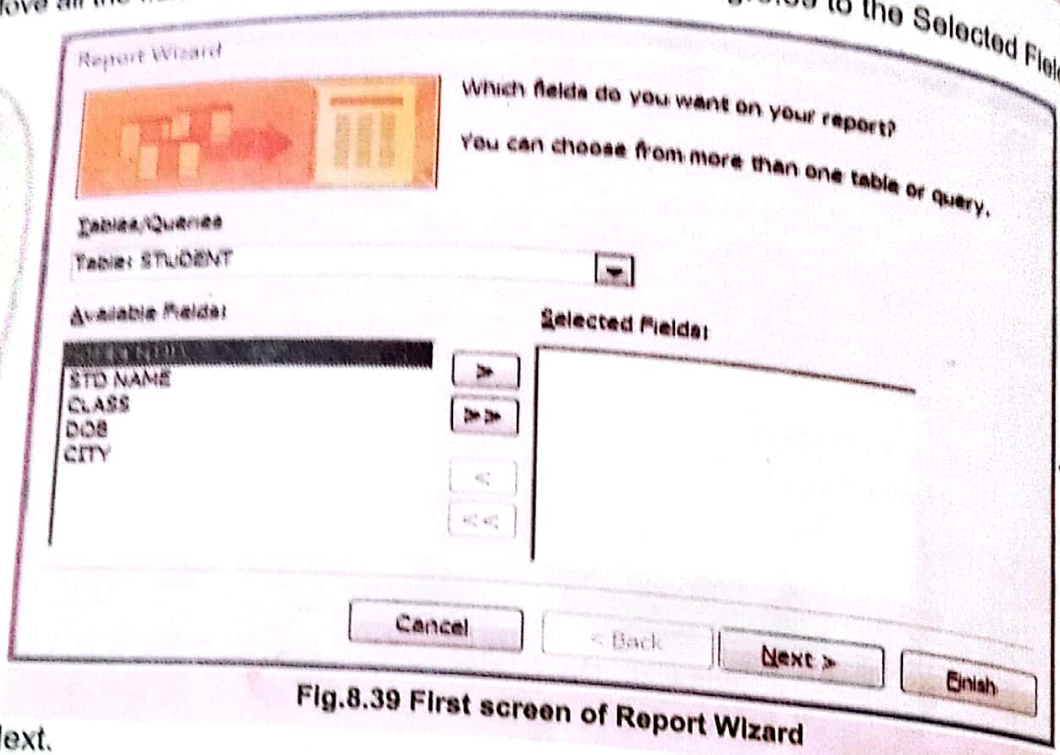

Fig.8.39 First screen of Report Wizard

5. Click Next.
6. Click Next again.
7. Select STD NAME to sort the report by student name and select ascending order by the button on the right side as shown in Fig.8.40.

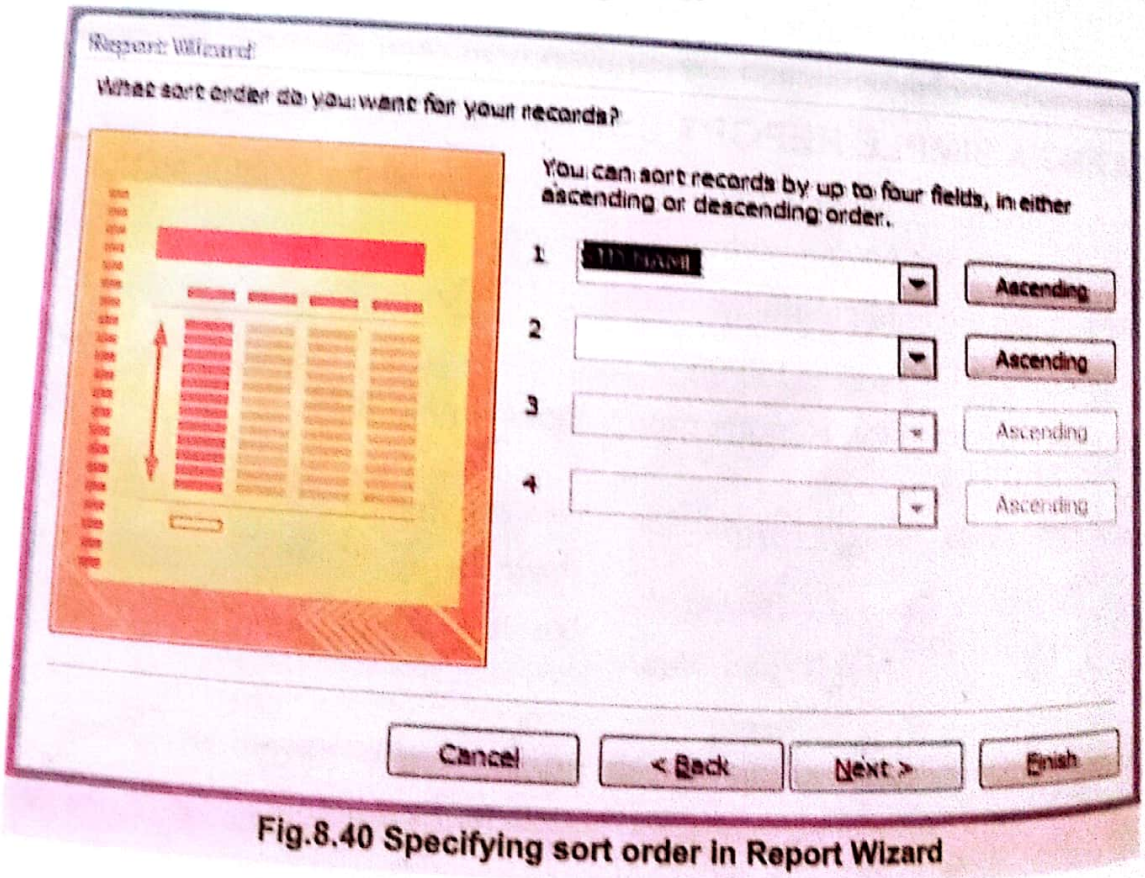

Fig.8.40 Specifying sort order in Report Wizard

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Access allows to sort records up to four fields and you can select Ascending or descending order for these fields.

Click Next.

Select Tabular layout and Portrait orientation for the report as shown in Fig.8.41 and click Next.

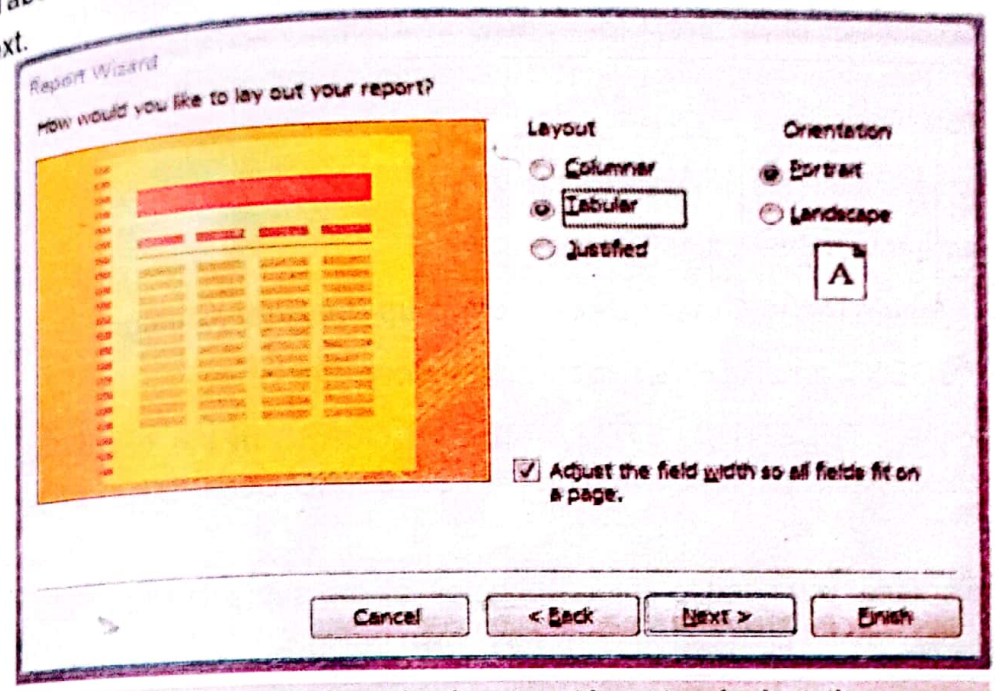

Fig.8.41 Screen for selecting report layout and orientation

elect a report style from the list shown in Fig.8.42 and click Next.

0.Enter a title for the report and click Finish.

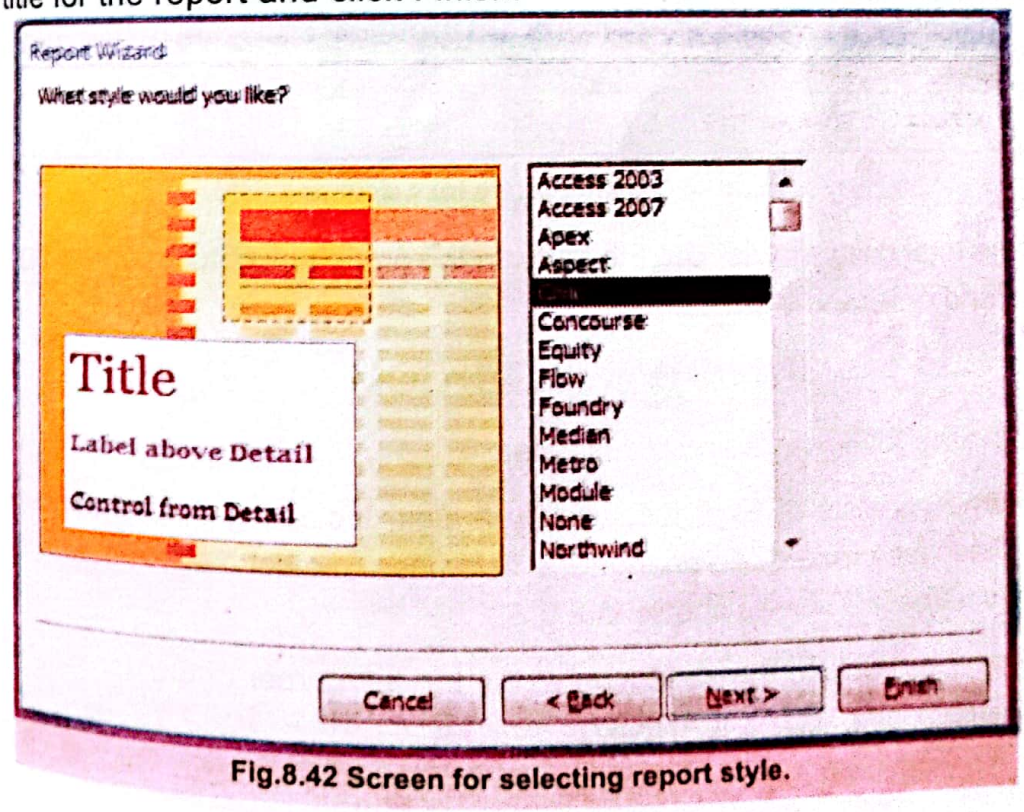

Fig.8.42 Screen for selecting report style.

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8.5.2 CREATING A REPORT USING A QUERY

Generally, database users use reports to display the results of a query, which is w we are going to do. Earlier in this unit we created relationship between the STUDENT ta and the RESULT table in the Student Database Management System. These tables having one-to-many relationship because a student has many examinations throughout year. Suppose you want to display the records of all the students who passed in all three subjects in the First Term Examination and their total marks. First we are going create a query for this report.

The following are the steps to create the query.

1. Click the Create tab on the Access ribbon.
2. Click Query Design in the Other group to bring up the query design window.
3. Add both STUDENT and RESULT tables and close the Show Table dialog box.
4. Double click the STUDENTID, STD NAME and CLASS in the box labeled STUDE and double click EXAMINATION, MATHS, PHYSICS AND COMPUTER in the box labe RESULT.
5. To set up the criteria, you need to enter >32 below all the subjects and FIRST TERM be EXAMINATION column in the Criteria row as shown in Fig.8.43.

EXAMINATION RESULT	MATHS RESULT	PHYSICS RESULT	COMPUTER RESULT	TOTAL: [MATHS]+[PH
"FIRST TERM"	>32	>32	>32	

Fig.8.43 Creating query for calculated field

To create the total column, click the Field row in the first blank column on the right side o design grid and enter the expression

MATHS+PHYSICS+COMPUTER

or calculating the total marks and press enter.

he field name consists of Expr followed by a digit, indicating the sequence in which alculated field was created. To change the field name, select the text before the colon oe the new name TOTAL as shown in Fig.8..

ve the query by clicking the save icon at the top left corner of the screen and give me CALCULATING TOTAL MARKS.

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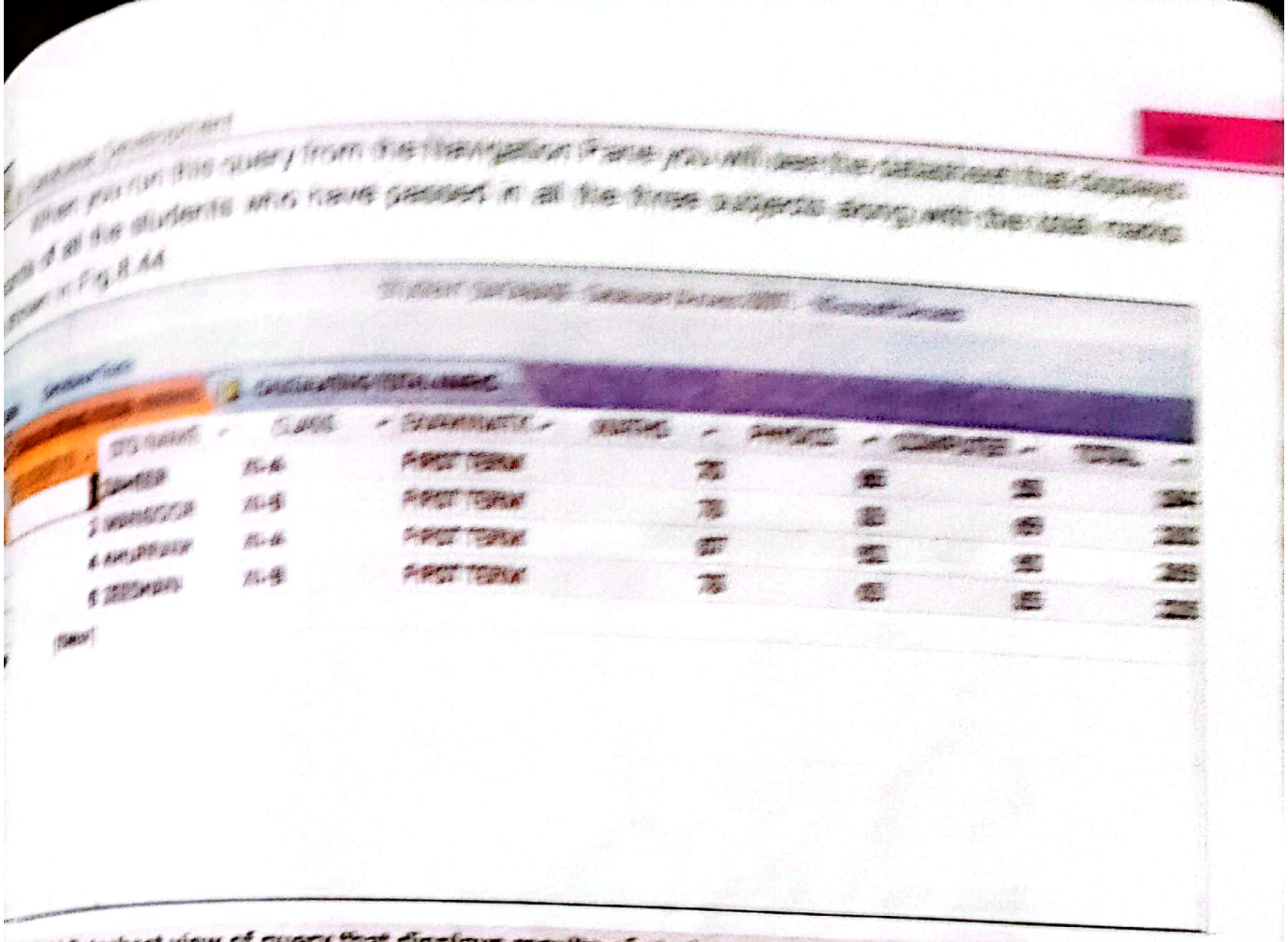

Fig.8.44 Datasheet view of query that displays results of students who have passed in all the three subjects along with the total marks

Now, we are going to use this query to create the report that will print the records of all students who have passed in all three subject along with the total marks.

The Following are the steps to create the report.

Click the Create tab on the Access ribbon and click Report Wizard in the Reports group.

Select the query CALCULATING TOTAL MARKS from the drop-down list of Tables/Queries as shown in Fig.8.45.

Move all the fields of query from the Available Fields list to the Selected Fields list using the buttons and click Next.

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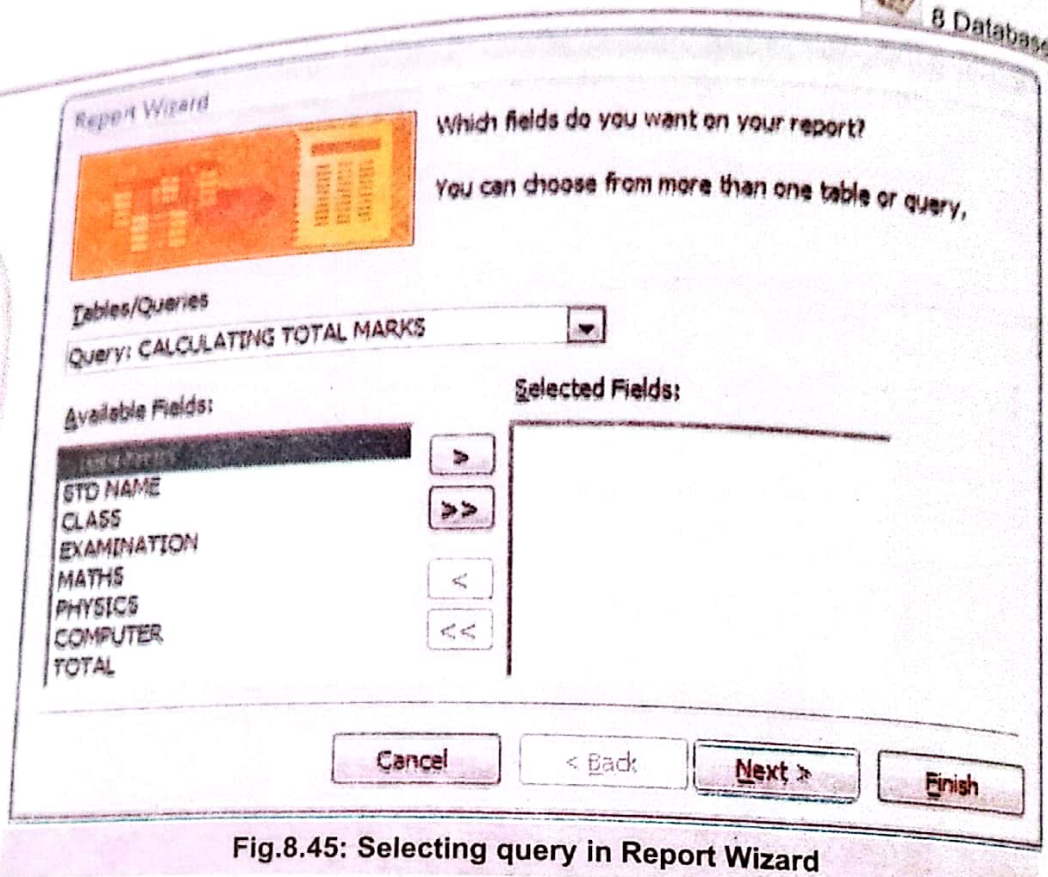

Fig.8.45: Selecting query in Report Wizard

4. *Click the* Next button to accept the default for viewing the data.
5. *Click the* Next button to accept the default grouping level.

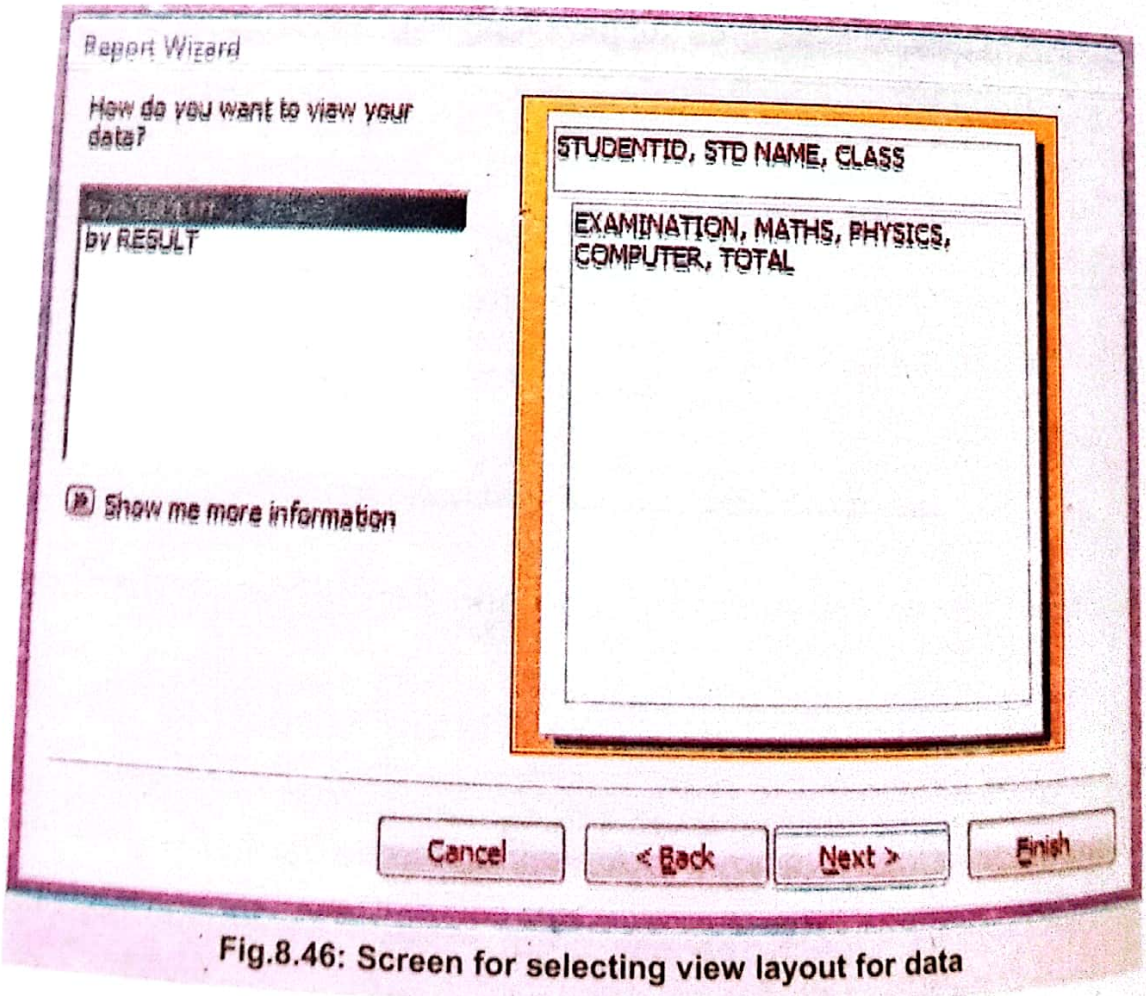

Fig.8.46: Screen for selecting view layout for data

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Click the Next button to accept the default for report layout.

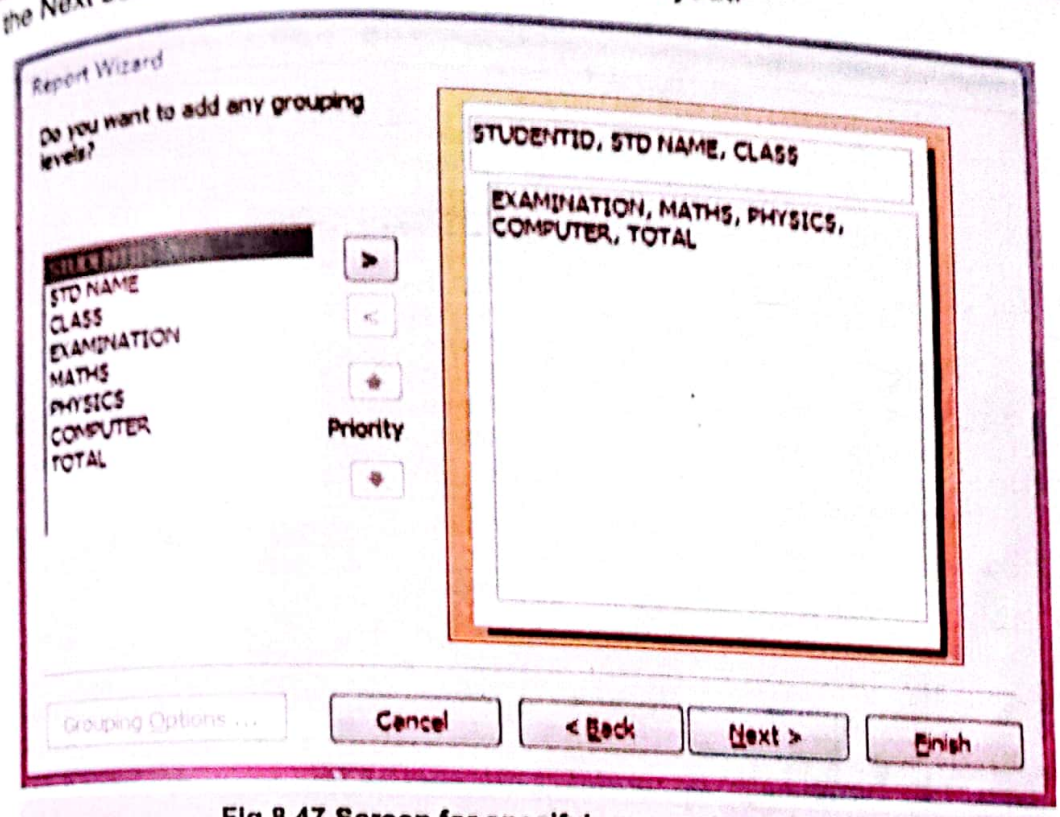

Fig.8.47 Screen for specifying grouping levels

Select the Aspect style for the report and click Next.

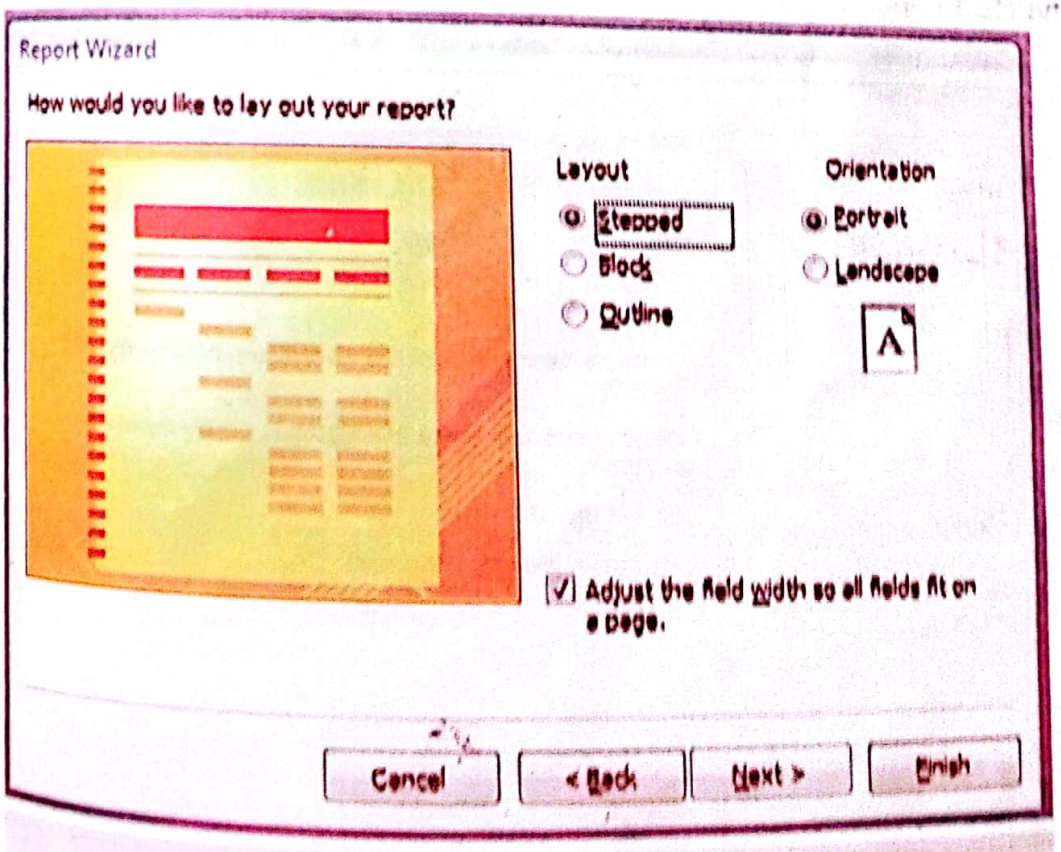

Fig.8.48 Screen for specifying lay out for report

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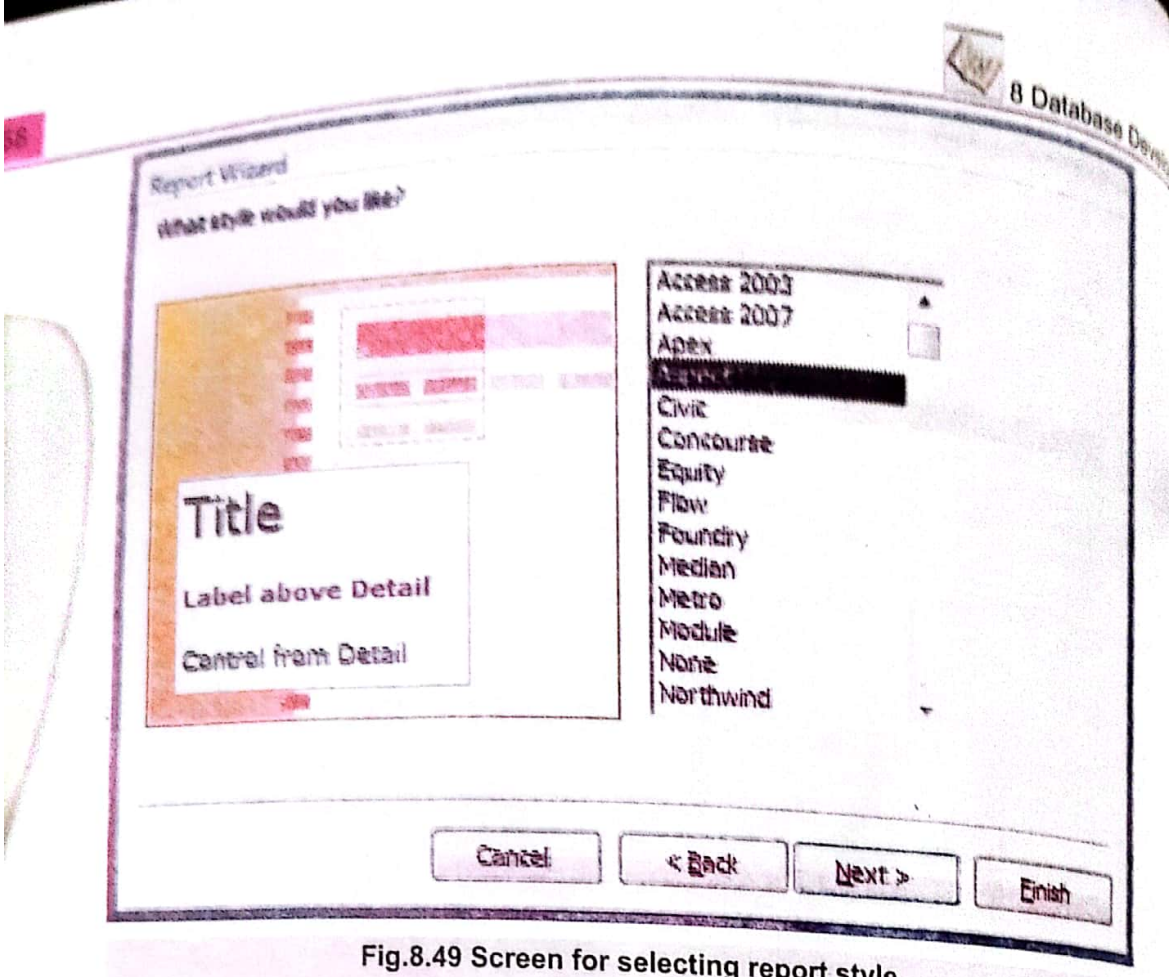

Fig.8.49 Screen for selecting report style

Give your report the title CALCULATION OF TOTAL MARKS and click Finish as s in Fig.8.50.

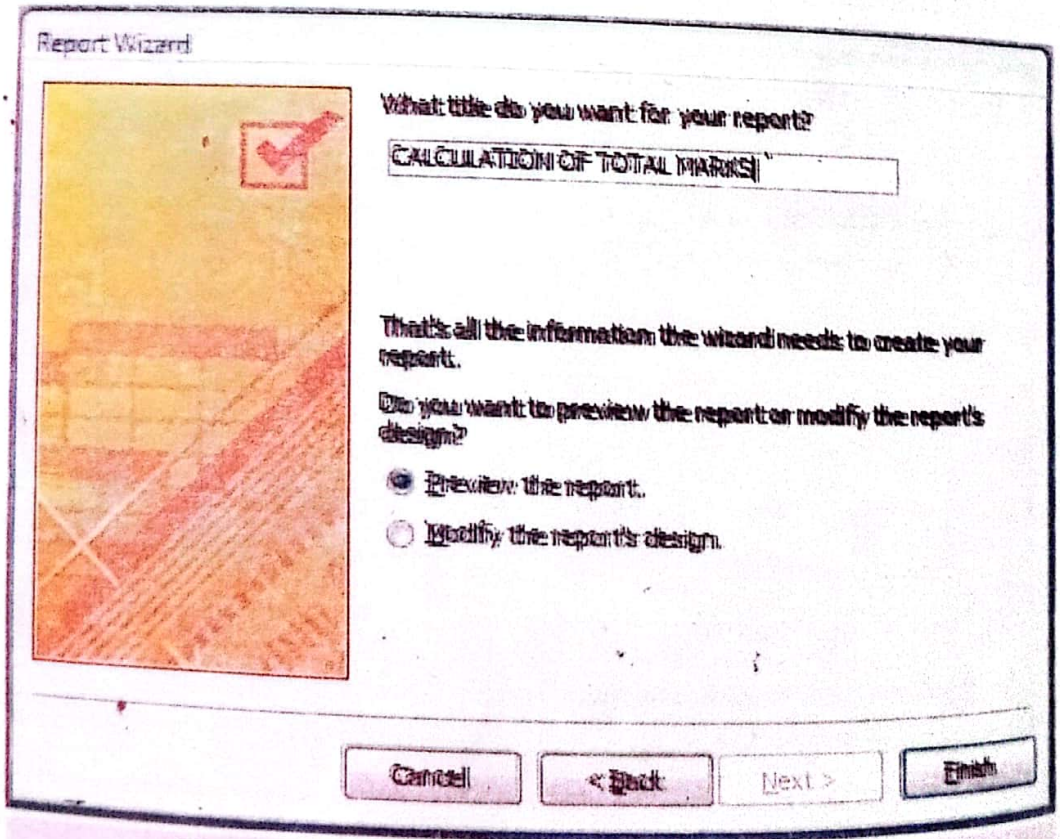

Fig.8.50 Report Wizard screen for specifying report title

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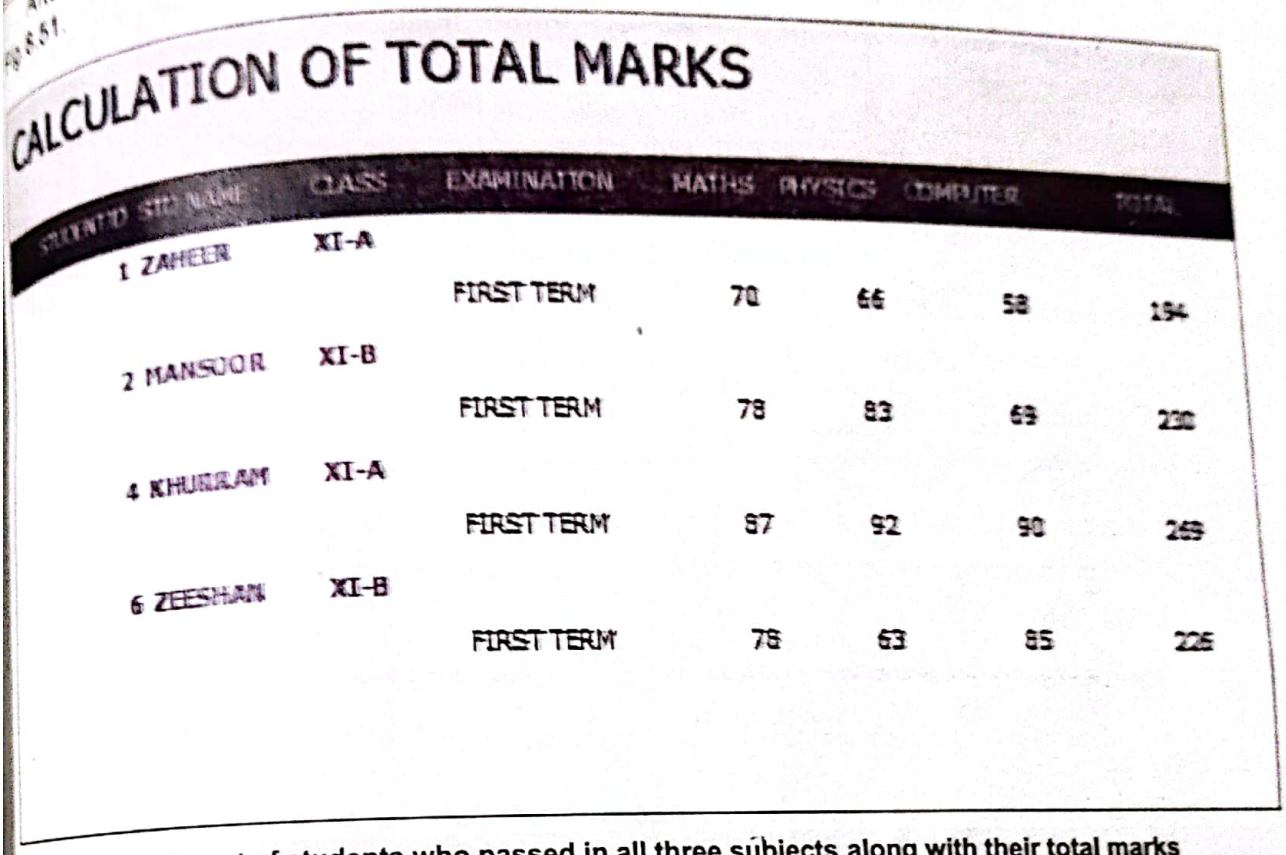
After clicking the Finish button, the report will be displayed on the screen as shown in Fig.8.51.



CALCULATION OF TOTAL MARKS

STUDENT SID NAME	CLASS	EXAMINATION	MATHS	PHYSICS	COMPUTER	TOTAL
1 ZAHEER	XI-A	FIRST TERM	70	66	58	194
2 MANSOOR	XI-B	FIRST TERM	78	83	69	230
4 KHURRAM	XI-A	FIRST TERM	87	92	90	269
6 ZEESHAN	XI-B	FIRST TERM	78	63	85	226

Fig.8.51 Report of students who passed in all three subjects along with their total marks

8.5.3 VIEWING AND PRINTING REPORT

Viewing a Report

When you create any database object, it is displayed in the Navigation Pane on the left side of the screen. To view the report, you just have to double click it.

Printing a Report

The following are the steps for printing a report.

1. Open the report that you want to print from the Access Navigation Pane by double clicking it.
2. Click the Microsoft Office button and then click Print. Keyboard shortcut for this command is Ctrl + P.
3. Specify the Print dialog box options and click Print to print your report.

If you want to quickly print all the pages in the report without using the Print dialog box, right click the report in the Navigation Pane and click Print. Access will print the entire report by using the margins, headers, footers and orientation (portrait or landscape) specified for the report. You cannot change any of these properties when you use this option.

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Formatting Reports and Forms

Reports and forms are used to display information contained in your databa both use the same technique and tools to format their controls. These techniques methods for moving and aligning the various controls, for changing the font style changing the color, border and shading effects for different elements. To work with c of a report or form, double click the report or form in the Navigation Pan. After oper report or form, click the View option in the Home tab ribbon and select Design Vie you can move any control to different position, change font size, style, color or background of a control, etc.

Key Points

- Microsoft Office Access 2007 is a member of Microsoft Office 2007 integrated s and it is the most popular software used worldwide for developing and ma databases.
- It provides tool for creating tables, forms, queries and reports that make up a datab
- In Access all the information of a database in stored in tables since it is a re database management system.
- Seven types of data types are generally used in Access which are text, memo, n autonumber, yes/no, currency and date/time.
- Sorting feature of Access allow to alphabetically or numerically sort the records in in ascending or descending order.
- A form is a tool that makes it easy to enter, delete, modify and view the infor stored in one or more tables in a database. It presents data in an organize attractive manner.
- Query is a tool that answers questions about data to select specific information from and to change selected data in various ways. It lets you see the data you want and order you want it.
- Report is a database object that organizes and formats data stored in tables or qu make it presentable and meaningful to other people. Reports are used to print data in tables and queries which is an essential part of using a database.
- Columnar report displays each field of a record on a separate line with a label to it spreads the information for a single record over many rows.
- Tabular reports display fields of records in a horizontal row with field labels at the to report.

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Exercise

Select the best answer for the following MCQs.

i. Which of the following is used to gather information based on one or more criteria?
A. Table B. Form
C. Query D. Report

ii. Which data field type is used to provide descriptive comments?
A. Text B. Memo
C. Autonumber D. Yes/No

iii. Selecting records in a table which match a given criteria is known as:
A. Sorting data B. Searching data
C. Updating data D. Filtering data

iv. The maximum number of records in a table that can use the Autonumber field is slightly more than:
A. 1 Million B. 1 Billion
C. 2 Billion D. 3 Billion

v. Which database object stores all the information of a database?
A. Table B. Form
C. Query D. Report

vi. What is the default value of number of characters for Text data type in Access?
A. 30 B. 40
C. 50 D. 60

vii. Which query is used to add records from a table to another table?
A. Select query B. Update query
C. Append query D. Make Table query

viii. Which query is used to change data in existing records?
A. Select query B. Update query
C. Append query D. Make Table query

ix. In which tab of Access ribbon Relationships icon is located?
A. Home B. Create
C. External Data D. Database Tools

x. In which tab of Access ribbon Query Design icon is located?
A. Home B. Create
C. External Data D. Database Tools

Give short answers of the following questions.

i. Which tasks can be performed using Microsoft Office Button?
ii. Describe various ways of deleting records in a table.
iii. What are the advantages of using forms?
iv. What is meant by referential integrity?
v. Describe how records can be added and deleted using forms.

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Glossary

plication Software	A set of programs designed to perform a specific task, such as typing a letter, preparing payroll, playing music or creating animated display
sembler	A system software that translates assembly language programs into machine language for execution by the computer.
synchronous ransmission	A type of transmission in which the time interval between the characters being transmitted varies.
ttribute	A property or characteristic of an entity.
us Topology	A type of topology in which the transmission medium is usually a single cable to which all the devices are attached.
ache Memory	Small amount of high-speed semiconductor memory which exists inside the microprocessor or on the motherboard of a computer.
ircuit Switched etwork	A mode of operation of a network in which communication path is first established between the source and the destination and used exclusively for the duration of the call or transaction.
lient	A computer on the network that accesses resources that are shared by other computers.
lient/Server Network	A computer network in which each computer on the network acts as either a server or a client.
ommunication edia	Communication lines used to transmit data between computers, such as telephone line, fiber optics or coaxial cable.
ompiler	A system software that translates entire program written in a high-level language into machine language program for execution by the computer.
omputer Casing	A box or an enclosure that contains most of the components of a computer except the input/output devices.
omputer Network	An interconnection between two or more computers so that they can communicate with each other.
omputer Program	A sequence of instructions which are stored in main memory of a computer and specify which operations are to occur to solve a problem.
ontrol Unit	A unit of CPU that directs and coordinates the operations of entire computer system.

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