5.1 Introduction to Data, Database and DBMS

Data Data is raw, unorganized facts and figures that have no meaning by themselves.

- Example: 25, "Ram", 2081/01/15, 45000
- Types: Numeric, Text (Character), Date, Logical (Yes/No).

Database A database is an organized collection of related data stored in a structured way so that it can be easily accessed, managed and updated.

- It is like a well-organized digital filing cabinet.
- Example: Employee database, Voter list, School student record, Government service record.

DBMS (Database Management System) DBMS is software that allows users to create, manage, update and retrieve data from a database.

- It acts as an interface between the user and the database.
- Popular DBMS: Microsoft Access (used in government offices), MySQL, Oracle, SQL Server, PostgreSQL.
- Advantages:
  - Reduces data redundancy
  - Provides data security and integrity
  - Allows multiple users to access data simultaneously
  - Supports backup and recovery

Key Difference
Data → Raw facts
Database → Organized collection of data
DBMS → Software used to manage the database

5.2 Basic Concept of Tables, Fields, Records, Relationships and Indexing

Concept	Definition	Example (Employee Database)
Table	Basic building block of a database. It is a collection of related data organized in rows and columns.	Employee Table
Field	A single column in a table that stores one type of information (also called Attribute).	EmployeeID, Name, Post, Salary, JoinDate
Record	A single row in a table that contains complete information about one entity.	One full row of an employee (e.g., Ram Shrestha's details)
Relationship	Connection between two or more tables to avoid data repetition.	One-to-One, One-to-Many, Many-to-Many
Indexing	A special structure that improves the speed of searching and sorting data in a table.	Index created on EmployeeID or Name column

Types of Relationships (Very Important for Exam)

1. **One-to-One** → One record in Table A relates to only one record in Table B (e.g., Employee ↔ Spouse).
2. **One-to-Many** → One record in Table A relates to many records in Table B (e.g., Department ↔ Employees).
3. **Many-to-Many** → Many records in Table A relate to many records in Table B (e.g., Students ↔ Subjects) – usually handled with a Junction table.

Primary Key

- A field that uniquely identifies each record (no duplicates allowed).
- Example: EmployeeID, Citizenship Number.

Foreign Key

- A field in one table that refers to the Primary Key of another table.
- Used to create relationships.

Indexing

- Makes searching faster (like index page in a book).
- Can be created on any field but most useful on Primary Key and frequently searched fields.

5.3 Introduction to Database Application

A **Database Application** is a user-friendly software (DBMS) that allows creating, managing and using databases without writing complex code.

- Popular example: **Microsoft Access**.
- It provides ready-made tools (Tables, Queries, Forms, Reports) through a Graphical User Interface (GUI).
- Main purpose in government offices: Maintain employee records, service records, inventory, voter lists, budget data, etc.
- Advantages: Easy to use, visual interface, built-in security, supports relationships, queries, forms and reports.

5.3.1 Data Types

Data types define the kind of data that can be stored in a field.

Data Type	Use	Example
Short Text	Text, names, codes (max 255 characters)	Name, Post, Address
Long Text	Long description or notes	Remarks, Bio
Number	Numeric values for calculation	Salary, Age, Quantity
Date/Time	Date and time values	Join Date, DOB
Currency	Money values with decimal	Salary, Budget
Yes/No	Logical (True/False)	Married (Yes/No)
AutoNumber	Automatic unique ID (Primary Key)	EmployeeID
Attachment	Files, photos, documents	Photo, CV

5.3.2 Creating, Modifying & Deleting Tables

Creating a Table:

- Create tab → Table Design (or Table).
- Add Field Name and Data Type → Set Primary Key → Save (Ctrl + S).

Modifying a Table:

- Design View: Change field name, data type, field size, caption, default value.
- Add/Delete fields, set validation rules.

Deleting a Table:

- Navigation Pane → Right-click table → Delete (data is permanently lost).

5.3.3 Establishing Relationships Among Tables

Relationships link tables to avoid data duplication.

Steps to Create Relationship:

1. Database Tools tab → Relationships.
2. Add tables to the Relationships window.
3. Drag Primary Key from one table to Foreign Key of another table.
4. Enforce Referential Integrity (optional but recommended).

Types of Relationships:

- One-to-One
- One-to-Many (most common)
- Many-to-Many (requires Junction table)

5.3.4 Formatting and Validating Field Data

Formatting Field Data:

- In Design View → Field Properties:
  - Format (e.g., Currency shows ₹ symbol)
  - Caption (user-friendly name)
  - Input Mask (e.g., phone number format)

Validating Field Data:

- Validation Rule: Limits what can be entered (e.g., >0 for salary).
- Validation Text: Error message shown to user.
- Required: Yes (field cannot be left blank).
- Example: Validation Rule = >=10000 for salary field.

5.3.5 Inserting, Modifying, and Deleting Data

Inserting Data:

- Open table in Datasheet View → Type directly in rows.
- Or use Form for easier data entry.

Modifying Data:

- Click in the field → Edit → Press Enter or move to next field.

Deleting Data:

- Select record (click row selector) → Delete key → Confirm.
- Or right-click record → Delete Record.

5.3.6 Creating, Modifying, Deleting and Using Simple Queries / Forms / Reports

Queries (for searching and filtering data)

- Create tab → Query Design → Add tables → Drag fields → Set criteria → Run (exclamation mark).
- Example: Query to show employees with salary > 50,000.

Forms (for easy data entry)

- Create tab → Form Wizard or Blank Form → Select fields → Finish.
- Used for user-friendly input screens.

Reports (for printing output)

- Create tab → Report Wizard → Select fields → Group, sort, layout → Finish.
- Can include totals, headers, footers and charts

Modifying / Deleting: Right-click object in Navigation Pane → Design View (to modify) or Delete.

5-Mark Short Answer Questions

Q1. (5 marks) Explain the concept of Data, Database and DBMS.
Answer:

- **Data**: Raw, unorganized facts and figures with no meaning (e.g., 25, "Ram", 2081/01/15).
- **Database**: Organized collection of related data stored in a structured way.
- **DBMS**: Software that creates, manages, updates and retrieves data from a database (e.g., Microsoft Access).
- DBMS reduces data redundancy, provides security and allows multiple users to work simultaneously.

Q2. (5 marks) Describe the basic concepts of Tables, Fields, Records, Relationships and Indexing in a database.
Answer:

- **Table**: Collection of related data in rows and columns.
- **Field**: Single column that stores one type of information (e.g., Name, Salary).
- **Record**: Single row containing complete information about one entity.
- **Relationship**: Link between two tables (One-to-One, One-to-Many, Many-to-Many).
- **Indexing**: Special structure that speeds up searching and sorting of data.

Q3. (5 marks) What is a Database Application? Name any one popular database application used in government offices.
Answer: A Database Application is user-friendly software (DBMS) that allows creating, managing and using databases through a graphical interface.

- Popular example: Microsoft Access.
- It provides tools for Tables, Queries, Forms and Reports.
- Used in government offices for employee records, service records, inventory, voter lists, etc.

Q4. (5 marks) List and explain any five important Data Types used in Microsoft Access.
Answer:

- **Short Text**: Text/names (max 255 characters).
- **Number**: Numeric values for calculation.
- **Date/Time**: Date and time values.
- **Currency**: Money values with decimal.
- **AutoNumber**: Automatic unique ID (used as Primary Key).
- **Yes/No**: Logical values (True/False).

Q5. (5 marks) Write the steps to create, modify and delete a table in Microsoft Access.
Answer:

- **Create**: Create tab → Table Design → Add Field Name and Data Type → Set Primary Key → Save.
- **Modify**: Open in Design View → Change field name, data type, properties.
- **Delete**: Navigation Pane → Right-click table → Delete.

Q6. (5 marks) Explain how to establish relationships among tables in Microsoft Access.
Answer:

- Database Tools tab → Relationships.
- Add required tables.
- Drag Primary Key from one table to Foreign Key of another table.
- Enforce Referential Integrity (optional).
- Types: One-to-One, One-to-Many, Many-to-Many.

Q7. (5 marks) Describe how to insert, modify and delete data in a table.
Answer:

- **Insert**: Open table in Datasheet View → Type data in rows.
- **Modify**: Click in the field → Edit → Press Enter.
- **Delete**: Select record (row selector) → Press Delete key → Confirm.

Q8. (5 marks) What are Queries, Forms and Reports? Write their uses.
Answer:

- **Query**: Used to search, filter and retrieve specific data.
- **Form**: User-friendly screen for data entry and viewing.
- **Report**: Formatted output for printing with totals, headings and charts. All are created from the Create tab.

10-Mark Long Answer Questions
Q1. (10 marks) Explain Data, Database and DBMS. Describe the basic concepts of Tables, Fields, Records, Relationships and Indexing.
Answer: Data: Raw facts. **Database**: Organized collection of related data. **DBMS**: Software to manage database (e.g., Microsoft Access).
Basic Concepts:

- **Table**: Main object containing data.
- **Field**: Column (stores one type of information).
- **Record**: Row (complete information of one entity).
- **Relationship**: Link between tables using Primary Key and Foreign Key.
- **Indexing**: Improves speed of searching and sorting.

These concepts form the foundation of any database.

Q2. (10 marks) What is a Database Application? Describe Data Types and the process of creating, modifying and deleting tables in Microsoft Access.
Answer: A Database Application is user-friendly DBMS software that helps create and manage databases easily. Microsoft Access is commonly used in government offices.
Data Types: Short Text, Number, Date/Time, Currency, AutoNumber, Yes/No, etc.
Table Operations:

- **Create**: Create tab → Table Design → Define fields and data types → Set Primary Key.
- **Modify**: Design View → Change field properties.
- **Delete**: Right-click table in Navigation Pane → Delete.

These steps are essential for building a proper database structure.
Q3. (10 marks) Explain how to establish relationships among tables. Also describe formatting and validating field data in Microsoft Access.
Answer: Establishing Relationships:

- Database Tools → Relationships → Add tables → Drag Primary Key to Foreign Key → Enforce Referential Integrity.

Formatting and Validating Field Data:

- In Design View → Field Properties:
  - Format, Caption, Input Mask.
  - Validation Rule (e.g., >=10000) and Validation Text.
  - Required = Yes.

These features maintain data accuracy and consistency.
Q4. (10 marks) Describe the process of inserting, modifying and deleting data. Also explain how to create and use simple Queries, Forms and Reports in Microsoft Access.
Answer: Data Operations:

- **Insert**: Datasheet View → Type data.
- **Modify**: Click field → Edit.
- **Delete**: Select record → Delete key.

Queries, Forms and Reports:

- **Query**: Create → Query Design → Add tables → Set criteria → Run.
- **Form**: Create → Form Wizard → Select fields.
- **Report**: Create → Report Wizard → Add grouping and totals.

These tools make data entry, searching and printing easy and user-friendly.

Q5. (10 marks) Explain the complete process of creating a simple database in Microsoft Access, including tables, relationships, data entry and output (Queries, Forms, Reports).
Answer:

1. Create new database file.
2. Create Tables in Design View → Define fields and data types.
3. Establish Relationships (Database Tools → Relationships).
4. Enter data in Datasheet View or Form.
5. Create Query for searching, Form for input, Report for printing.

This complete process is used in government offices for maintaining official records.