Key points needed to be included for the Solution of the Assignment.

1. What is a database? Explain the advantages of DBMS compared to traditional file-based systems.

- **Database:** Organized collection of data for efficient storage, retrieval, and management.
- **Advantages of DBMS:**
  - Data centralization
  - Minimized redundancy
  - Enhanced data security
  - Easier data sharing and integration
  - Support for complex queries and relationships

2. What is the importance of a database in today's technology-driven world?

- Enables efficient data management for decision-making.
- Backbone of applications in banking, healthcare, e-commerce, etc.
- Facilitates big data analysis, cloud computing, and AI systems.

3. Define DBMS. Explain its objectives and functions.

- **DBMS:** Software for managing databases (e.g., MySQL, Oracle).
- **Objectives:** Data integrity, security, reduction of redundancy, and efficient retrieval.
- **Functions:** Data storage, query processing, transaction management, backup, and recovery.

4. Differentiate between centralized and distributed database systems.

- **Centralized:** Data stored in a single location.
  - Pros: Easier management, better security.
  - Cons: Bottleneck risk, single point of failure.
- **Distributed:** Data spread across multiple locations.
  - Pros: Scalability, faster access.
  - Cons: Complex synchronization and management.

5. Differentiate between database and database management system.

- **Database:** Collection of data.
- **DBMS:** Software that manages databases, providing tools for access, security, and queries.

6. Differentiate between DBMS and database application software.

- **DBMS:** Backend system managing the data (e.g., MySQL, PostgreSQL).
- **Application Software:** Frontend interface that interacts with DBMS (e.g., CRM systems).

7. What is a database model? Explain the relational model.

- **Database model:** Framework for data organization.
- **Relational model:** Data represented in tables (relations) with rows (tuples) and columns (attributes).
  - Example: Student table with attributes like name, roll_no, class.

8. What are the characteristics of a good data model?

- Simplicity and clarity
- Flexibility for future needs
- High integrity and reduced redundancy
- Easy to query and understand

9. What is data modeling? Explain the different techniques of data modeling.

- **Data Modeling:** Process of designing a database structure.
- **Techniques:**
  - **Conceptual:** High-level overview (ER diagram).
  - **Logical:** Mapping entities to tables, attributes to columns.
  - **Physical:** Actual database implementation.

10. What is a hierarchical database model? List its advantages and disadvantages.

- **Hierarchical Model:** Data organized in tree-like structure (parent-child).
  - **Advantages:** Simplicity, quick access.
  - **Disadvantages:** Inflexibility, difficulty handling complex relationships.

11. Explain the different types of database models with examples.

- **Types:** Hierarchical, Network, Relational, Object-Oriented.
- Include diagrams showing relationships (e.g., parent-child for hierarchical).

12. What are the benefits of centralized and decentralized database models?

- **Centralized:** Better control, improved security, easier backup.
- **Decentralized:** Faster local access, fault tolerance.

13. What is the relational data model? Explain with examples. List its advantages and disadvantages.

- **Relational Model:** Represents data in tables.
- **Advantages:** Simplicity, flexibility.
- **Disadvantages:** Performance issues with large datasets.

14. What is RDBMS? List the functions of RDBMS.

- **RDBMS:** Relational Database Management System.
- **Functions:** Data storage, querying, relationships between tables, and enforcing constraints.

15. Explain the benefits of RDBMS.

- Simplified data management
- Data consistency and integrity
- Scalability and security

16. What are domains and tuples?

- **Domain:** Range of valid values for an attribute.
- **Tuple:** A single row of data in a table.

17. Define DML and DDL with three examples each.

- **DML (Data Manipulation Language):** SELECT, INSERT, UPDATE.
- **DDL (Data Definition Language):** CREATE, ALTER, DROP.

18. Write SQL DDL commands for a schema: `student_info(reg_no, name, class, gender, address).`

```
CREATE TABLE student_info (
    reg_no INT PRIMARY KEY,
    name VARCHAR(50),
    class INT,
    gender CHAR(1),
    address VARCHAR(100)
);
```

19. What is data integrity? State and describe the different types of data integrity.

- **Data Integrity:** Ensuring data accuracy and consistency.
- **Types:**
    - Entity Integrity (unique identifiers)
    - Referential Integrity (foreign key relationships)
    - Domain Integrity (valid values)

20. Why is data integrity important when designing a database? Explain.

- Prevents data corruption.
- Ensures accurate relationships.
- Maintains consistency.

21. What is data security? How can it be implemented?

- **Data Security:** Protecting data from unauthorized access.
- **Methods:** Authentication, encryption, access control, regular audits.

22. What is Normalization? Write its advantages and explain its importance.

- **Normalization:** Organizing data to minimize redundancy.
- **Advantages:** Improved integrity, better performance, and easier maintenance.

23. Explain the purpose of Normalization.

- Reduce redundancy.
- Ensure data integrity.
- Simplify relationships.

24. Why is normalization needed? Explain the normalization process with examples.

- **Need:** Avoid duplication and anomalies.
- **Process:** Progress through forms (1NF, 2NF, etc.) with examples.

25. What are 1NF, 2NF, and 3NF? Explain each with examples.

- **1NF:** Atomic values.
- **2NF:** Eliminate partial dependencies.
- **3NF:** Eliminate transitive dependencies.

26. What is an ER diagram? List its advantages in system design.

- **ER Diagram:** Graphical representation of entities and their relationships.
- **Advantages:** Clear visualization, simplifies database design.

27. What is the purpose of an ER diagram? Describe the symbols used with examples.

- **Purpose:** Conceptualize database structure.
- **Symbols:** Rectangle (entity), Oval (attribute), Diamond (relationship).

28. Explain the entity, attribute, and relationship in the ER diagram.

- **Entity:** Object or thing (e.g., Student).
- **Attribute:** Property (e.g., Name, ID).
- **Relationship:** Association between entities (e.g., Student-Enrolls-Course).

29. Who is a database administrator (DBA)? List their roles, functions, and responsibilities.

- **DBA:** Individual managing database systems.
- **Roles:** Security, backup, performance tuning, user access management.