Oracle Basic Notes

1. What is RDBMS?

- RDBMS (Relational Database Management System) allows users to create, update, and manage relational databases.
- Features:
  - Reliable, scalable, easy to implement.
  - Stores and retrieves large volumes of data.
- Uses tables to organize data and SQL (Structured Query Language) for querying and managing data.

2.How RDBMS Works?

- Organizes data using a relational model.
- Tables are linked by keys:
  - **Primary Key**: Unique identifier for each row.
  - **Foreign Key**: Links data from one table to another.

Examples of RDBMS

- Oracle, MySQL, PostgreSQL, MariaDB, DB2, Microsoft SQL Server.

3.Relational Database Model

- Developed by **E.F. Codd (1970s)** at IBM.
- Data stored in tables (rows = records, columns = attributes).
- Relationships between tables created using keys.
- Avoids hierarchical structures; data can be accessed and related dynamically.

4. Importance of Databases

- Essential for nearly all applications: web apps, enterprise systems, AI, ML, blockchain, IoT, etc.
- Over **343 databases** available globally.

- Popular databases:
    - Oracle, MS SQL Server, Teradata, IBM DB2, Sybase, MySQL, PostgreSQL, Netezza.

5. Oracle Database – Background & Key Features

History

- **1970**: Edgar F. Codd's paper on RDBMS transformed database management.
- **1979**: Larry Ellison launched Oracle, the first commercially available RDBMS.
- **1977: Larry Ellison** is the **Chairman of the Board** and **Chief Technology Officer (CTO)** of **Oracle Corporation**.
- He co-founded Oracle in **1977** and led it as CEO until **2014**.
- As CTO, he guides Oracle's technology strategy, focusing on **cloud computing, AI, and database innovation**.
- He remains a key figure in shaping the future of Oracle's products and services.
- Oracle became dominant in Unix and Linux environments and evolved with new technologies.

Key Features of Oracle

1. Proprietary RDBMS with advanced features.
2. **ACID** compliant transactions ensure consistency.
3. Supports multiple data types:
    - Structured (SQL), Semi-structured (JSON, XML), Spatial, RDF.
4. Offers **Blockchain Tables**.
5. Handles both **OLTP (Online Transaction Processing)** and **OLAP (Online Analytical Processing)** workloads.

6. Oracle Database 23ai – Innovations, Use Cases, and Limitations

Oracle Database 23ai (May 2024)

- Major advancement integrating **AI capabilities** directly into the database.
- Benefits:
    1. Simplifies **AI-powered app development**.
    2. Enhances **data security**.
    3. Improves **scalability** across deployment environments.

Key Innovations

1. **AI Vector Search** – Fast similarity search for unstructured data (text, images).
2. **JSON Relational Duality** – Relational and JSON models used together.
3. **Developer Tools** – JavaScript procedures, reactive extensions, pipelining.
4. **SQL Enhancements** – New data types, fuzzy matching, improved syntax.
5. **Graph Processing** – Built-in support for property graphs.
6. **Observability** – OpenTelemetry tracing, Grafana dashboards.
7. **Security** – SQL Firewall to block unusual queries.

When to Use Oracle

✓ Converged database (OLTP + OLAP).
✓ Structured data with strict ACID guarantees.
✓ Blockchain tables required.
✓ Data warehousing and spatial data needs.

When NOT to Use Oracle

✗ Tight budget or cost-sensitive projects.
✗ Multi-master ACID transactions required.
✗ Highly relational (e.g., social networks).
✗ Advanced querying on semi-structured JSON data.

7.Advantages, Disadvantages, and Setup of Oracle

Advantages

1. **Scalability** – Handles growing data effortlessly.
2. **High Performance** – Optimized for fast queries.
3. **Data Security** – Protects against unauthorized access.
4. **Flexibility** – Supports multiple data models and cloud/on-premises deployment.
5. **High Availability** – Tools like RAC and Data Guard ensure uptime.

Disadvantages

1. **Costly** – Licensing and support are expensive.
2. **Complexity** – Requires expertise for setup and management.
3. **Hardware Intensive** – Needs robust infrastructure.
4. **Maintenance** – Frequent updates and tuning required.

Setup Instructions

- Install Oracle 11g or 21c using provided videos.
- Use **SQL Developer** for database management.