REG NO: 21RP03766

CLASS: ECO YEAR 3

ORACLE DATABASE ADMINISTRATION WORK 1

Q1. Describe oracle memory structures and background processes.

Oracle Database uses various memory structures and background processes to efficiently manage and handle data. These memory structures and processes play a crucial role in ensuring the system's performance, reliability, and scalability. Here are some key Oracle memory structures and background processes:

Memory Structures:

1. **System Global Area (SGA):**
    - The SGA is a shared memory region that stores data and control information for the entire Oracle instance.
    - Components of SGA include:
        - **Database Buffer Cache:** Caches data blocks to reduce disk I/O.
        - **Shared Pool:** Manages shared SQL and PL/SQL areas, including parsed queries and execution plans.
        - **Large Pool:** Used for large memory allocations such as parallel execution buffers and recovery operations.
        - **Java Pool:** Manages Java execution memory.
2. **Program Global Area (PGA):**
    - The PGA is a memory region that stores data and control information for an individual Oracle session or process.
    - Each user connecting to the database has a dedicated PGA.

Background Processes:

1. **Oracle Database Processes:**
    - **DBWn (Database Writer):** Writes modified blocks from the database buffer cache to the data files on disk.
    - **LGWR (Log Writer):** Writes redo log entries from the redo log buffer to the online redo log files.

- **CKPT (Checkpoint):** Initiates and controls the checkpoint process, which synchronizes the data files and the control file.
- **SMON (System Monitor):** Performs instance recovery, ensuring that the database is in a consistent state after a failure.
- **PMON (Process Monitor):** Performs process recovery and cleans up resources when a user process terminates abnormally.
- **ARCH (Archiver):** Archives filled online redo log files to archival destinations for backup and recovery.

2. **Optional Background Processes:**
    - **LMSn (Lock Manager Server):** Coordinates global resource locking in Oracle Real Application Clusters (RAC) environments.
    - **RSMN (Recovery Server):** Manages distributed recovery in a distributed database environment.
    - **MMAN (Memory Manager):** Manages automatic memory tuning in Oracle 10g and later versions.
3. **Job Queue Processes:**
    - **CJQ0 (Job Queue Coordinator):** Coordinates the execution of scheduled jobs.
    - **J000 to J999 (Job Queue Slave Processes):** Execute scheduled jobs and other background tasks.

These memory structures and background processes collectively ensure the proper functioning, performance, and recovery capabilities of Oracle Database. They manage data consistency, handle concurrency, and provide the necessary infrastructure for both single-instance and clustered database environments.

Q2. Describe oracle logical and physical storage structures.

Oracle Database uses both logical and physical storage structures to organize and manage data efficiently. These structures play a vital role in storing and retrieving data while ensuring data integrity and performance. Let's explore the concepts of Oracle's logical and physical storage structures:

❖ **Logical Storage Structures:**

1. **Tablespace:**
    - A logical storage container that groups related database objects together.

- Consists of one or more data files.
- Each table and index belongs to a specific tablespace.

2. **Table:**
    - The fundamental storage unit for data in a relational database.
    - Organized into rows and columns.
    - Data is stored in segments within tablespaces.
3. **Index:**
    - A data structure that enhances the speed of data retrieval operations on a database table.
    - Consists of an ordered set of keys pointing to the actual data rows.
4. **View:**
    - A virtual table defined by a query.
    - Does not store data itself but provides a way to present data from one or more tables.
5. **Cluster:**
    - A group of tables physically stored together based on a common column.
    - Improves query performance for related data.
6. **Sequence:**
    - A database object that generates unique numbers.
    - Often used to generate primary key values.
7. **Synonym:**
    - An alias for a table, view, sequence, or other schema objects.
    - Simplifies access to objects in other schemas.

❖ **Physical Storage Structures:**

1. **Data Files:**
    - Physical files on the operating system that store the actual data.
    - Belong to a specific tablespace.
    - Can be spread across multiple disks for performance.

2. **Control Files:**
    - Binary files that store metadata about the database, such as the database name, data file locations, and redo log information.
    - Essential for database recovery.
3. **Redo Log Files:**
    - Files that record all changes made to the database.
    - Crucial for database recovery and rollback operations.
4. **Archive Logs:**
    - Copies of redo log files that have been archived.
    - Used for backup and recovery purposes.
5. **Parameter Files:**
    - Text files containing initialization parameters for configuring the database.
6. **Tablespaces (Physical Aspect):**
    - Actual disk space where the data is physically stored.
    - Can consist of one or more data files.
7. **Segments:**
    - The physical storage for database objects (tables, indexes).
    - Each object has one or more segments.
8. **Extent:**
    - A contiguous set of data blocks allocated to a segment.
    - Basic unit of storage allocation.
9. **Data Blocks:**
    - The smallest unit of data storage in Oracle.
    - Each block contains a specific amount of data.

Understanding both logical and physical storage structures is crucial for designing and maintaining an efficient Oracle Database. Logical structures define the high-level organization of data, while physical structures determine how the data is stored on disk. Efficient management of these structures is essential for optimizing performance, ensuring data integrity, and facilitating backup and recovery operations.