

# **Homework#3**

## **ACS575 Database Systems, Spring 2024**

**Due Date: March 22**

- Submit your homework as a single compressed file, labeled with YourLastName\_YourFirstName\_ACS575\_HW3.zip.
- Your submission should be organized into two main sections: Part I and Part II. Please ensure each section is clearly labeled within your file
- Within each section, clearly number your responses to correspond with the question numbers, for example, Q1, Q2(1), and so forth.
- While this homework is designed with Oracle RDBMS in mind, you are free to use other RDBMS platforms, provided they offer similar functionality. If you opt for a different RDBMS, please clearly state which one you've selected and describe any challenges or limitations you encountered that pertain to the homework exercises.

### **Preparation Instructions:**

This homework uses a movie database.

- Download the provided SQL script file, Movie\_Actor\_Casting\_Tables.sql file, and familiarize yourself with its contents.
- Run the script file within your database environment to create three tables: movie, actor, and casting.

### **Part I. Database APIs**

Part I is dedicated to hands-on practice with database programming interfaces (APIs). While the primary focus is on utilizing JDBC for database connectivity in Java, you also have the option to use a Python database API for completing the tasks.

Please download the provided HW3\_PartI\_JDBC.java and examine the code. The java program executes two distinct database queries:

- (i) It retrieves the title of movies which feature more than 15 actors.
- (ii) Upon receiving a movie title inputted by the user, it lists the IDs, names and casting orders of actors in that movie, sorted by their casting order.

### **Tasks:**

- Complete the 'HW3\_PartI\_JDBC.java' file by filling in the blanks labeled (1) to (14) with the appropriate Java and JDBC code snippets.

- Submit the fully completed 'HW3\_PartI\_JDBC.java' file. Only the Java file is required, excluding any other project or configuration files.
- Provide a screenshot or text output showing the successful execution of the program and its results.

For those who prefer Python, you have the option to complete the same tasks using a Python database API such as sqlite3, psycopg2 for PostgreSQL, or cx\_Oracle for Oracle databases. Your Python script should perform the same database queries and provide similar output as the Java program.

## Part II. Physical Database Organization and Index

Part II of this homework involves examining the state of a physical database through system catalog tables, commonly known as data dictionary tables or views in Oracle. The questions in this section are based on the Oracle Data Dictionary.

If you opt for a different RDBMS, please clearly state which one you've selected. Your SQL scripts should perform similar output as with Oracle. If there are any limitations with the DBMS you opt, clearly describe it and alternatives to the homework exercises.

**Q1.** (1) Construct and execute a SQL query to extract information (username, account status, default tablespace, temporary tablespace, and created date) about your user account from USER\_USERS data dictionary view. (2) Present the result of your query execution.

For guidance on using the USER\_USERS view, consult the Oracle documentation available at [https://docs.oracle.com/en/database/oracle/oracle-database/19/refrn/ALL\\_USERS.html#GUID-DDD25C8F-7EC9-46BC-ABEA-529C64FA09E2](https://docs.oracle.com/en/database/oracle/oracle-database/19/refrn/ALL_USERS.html#GUID-DDD25C8F-7EC9-46BC-ABEA-529C64FA09E2)

**Q2.** (1) Formulate a SQL query to gather details about the "USERS" tablespace, including its name, block size, initial extent, max extents) from USER\_TABLESPACES (or ALL\_TABLESPACES) data dictionary view. (2) Provide the outcome of executing your query.

For the USER\_TABLESPACES view, refer to [https://docs.oracle.com/en/database/oracle/oracle-database/19/refrn/DBA\\_TABLESPACES.html#GUID-B28A7D79-24E3-49B5-B948-7C2277CB1FB8](https://docs.oracle.com/en/database/oracle/oracle-database/19/refrn/DBA_TABLESPACES.html#GUID-B28A7D79-24E3-49B5-B948-7C2277CB1FB8)

**Q3.** (1) Formulate a SQL statement to collect information on all tablespaces and associated physical data files, such as the tablespace name, file name, file size in bytes, file size in Oracle blocks, available space for user data, and the count of blocks usable for data, by querying the DBA\_DATA\_FILE data dictionary view.

For DBA\_DATA\_FILES, refer to [https://docs.oracle.com/en/database/oracle/oracle-database/19/refrn/DBA\\_DATA\\_FILES.html#GUID-0FA17297-73ED-4B5D-B511-103993C003D3](https://docs.oracle.com/en/database/oracle/oracle-database/19/refrn/DBA_DATA_FILES.html#GUID-0FA17297-73ED-4B5D-B511-103993C003D3)

NOTE: Accessing the DBA\_ dictionary view requires DBA privilege, which may not be available in your account for Oracle at Diamond.pfw.edu. If using a personal Oracle setup where you possess DBA rights, this limitation does not apply.

For this question, Q3, submission of the SQL query statement is mandatory, but the query result is optional.

**Q4 – Q6.** Before proceeding with questions Q4 to Q6, ensure you have the movie, actor and casting tables ready in your database. If these tables are not present, run the provided 'Movie\_Actor\_Casting\_Tables.sql' to create them.

**Q4.** Start by executing the ANALYZE statements provided. These statements enable the Oracle DBMS to gather statistical information about each table, which is crucial for the subsequent questions.

```
ANALYZE TABLE movie COMPUTE STATISTICS;  
ANALYZE TABLE actor COMPUTE STATISTICS;  
ANALYZE TABLE casting COMPUTE STATISTICS;
```

It is important to execute these ANALYZE statements before answering the following questions.

**Q5.** (1) Construct a SQL query to extract statistics from the USER\_TABLES data dictionary view for the actor, casting and movie tables. Your query should include the total number of rows, the amount of data blocks used, the average free space available in each table, the count of chained rows, the average row length, and the average freespace on freelists for each table. (2) Display the results of your query.

For USER\_TABLES, refer to [https://docs.oracle.com/en/database/oracle/oracle-database/19/refrn/ALL\\_TABLES.html#GUID-6823CD28-0681-468E-950B-966C6F71325D](https://docs.oracle.com/en/database/oracle/oracle-database/19/refrn/ALL_TABLES.html#GUID-6823CD28-0681-468E-950B-966C6F71325D)

**Q6.** (1) Formulate a SQL query to access index details for the actor, casting and movie tables from the USER\_INDEXES data dictionary view. The information retrieved should cover the index name, associated table name, index type, uniqueness status, index height, number of leaf blocks, average leaf blocks per key and average data blocks per key. (2) Present the outcome of your query execution.

For USER\_INDEXES, refer to [https://docs.oracle.com/en/database/oracle/oracle-database/19/refrn/ALL\\_INDEXES.html#GUID-E39825BA-70AC-45D8-AF30-C7FF561373B6](https://docs.oracle.com/en/database/oracle/oracle-database/19/refrn/ALL_INDEXES.html#GUID-E39825BA-70AC-45D8-AF30-C7FF561373B6)

**Q7.** Consider the following normalized relations for a sports league.

TEAM (TeamID, TeamName, TeamLocation, TeamLeague, TeamManger)

PLAYER (PlayerID, PlayerFirstName, PlayerLastName, PlayerDateOfBirth, PlayerSpecialtyCode)

SPECIALTY (SpecialtyCode, SpecialtyDescription, Salary)

LOCATION (LocationID, CityName, CityState, CityCountry, CityPopulation)

MANAGER (ManagerID, ManagerName)

LEAGUE (LeagueID, LeagueName, LeagueLocation)

The following database operations are typical:

- Adding new players.
- Updating player specialty codes
- Updating city populations
- Reporting players by team
- Reporting players by team and specialty
- Reporting players ordered by salary
- Reporting teams and their players by city

For this situation,

- (1) Identify all possible foreign keys.
- (2) What column(s) in a table do you would recommend for indexes.
- (3) Specify the types of indexes you recommend for them.
- (4) Explain how you used the list of operations described above to arrive at your recommendation.