

### Final Lab Exam

Course Code: CSE 3108 Course Title: Database Management Systems Sessional Date: 04/11/2024 (Mon 10:00 AM)  
3<sup>rd</sup> Year, 1<sup>st</sup> Semester

[Note: Create Different Database for Each Lab Questions]

#### Lab Question – 1

Apply trigger in a database.

Submit your SQL code and screenshots of the executed query outputs.

#### Lab Question – 2

You are working with a university database that contains the following tables:

##### 1. Students

student_id	name	department_id	age
1	Alice	101	21
2	Bob	102	22
3	Charlie	101	20
4	Diana	103	23
5	Eve	102	22
6	Frank	104	24

##### 2. Departments

department_id	department_name
101	Computer Science
102	Mechanical Eng.
103	Civil Eng.
104	Electrical Eng.

##### 3. Grades

student_id	subject	grade
1	Databases	85
2	Thermodynamics	78
3	Algorithms	92
4	Structures	88
5	Robotics	74
1	Networking	89
3	Data Mining	95

Task:

- Write an SQL query to join the Students, Departments, and Grades tables to display the student\_id, name, department\_name, subject, and grade.
- Modify the query to group the results by department\_name and find the total number of students in each department who have grades recorded in the Grades table.
- Further extend the query to order the grouped results by the total number of students in each department in descending order.

- Create an additional column that shows the highest grade achieved by any student in each department, and ensure the results are ordered first by the total number of students (in descending order) and then by the highest grade (in descending order).

Expected Output:

department_name	total_students	highest_grade
Computer Science	2	95
Mechanical Eng.	2	78
Civil Eng.	1	88
Electrical Eng.	0	NULL

Submit your SQL code and screenshots of the executed query outputs with the sample data provided.

#### Lab Question – 3

You are working with the following university database tables:

##### 1. Students

student_id	name	department_id	age
1	Alice	101	21
2	Bob	102	22
3	Charlie	101	20
4	Diana	103	23
5	Eve	102	22
6	Frank	104	24

##### 2. Departments

department_id	department_name
101	Computer Science
102	Mechanical Eng.
103	Civil Eng.
104	Electrical Eng.

##### 3. Grades

student_id	subject	grade
1	Databases	85
2	Thermodynamics	78
3	Algorithms	92
4	Structures	88
5	Robotics	74
1	Networking	89
3	Data Mining	95

Task:

- Create a stored procedure named GetTopStudentsByDepartment that takes a

department\_id as an input parameter and returns:

- The student\_id, name, subject, and grade of students in that department with the highest grade in each subject.
- 2. Ensure the procedure:
  - Joins the Students, Departments, and Grades tables.
  - Filters records to only include students from the specified department.
  - Groups the results by subject and shows the student with the highest grade per subject.
- 3. **Call the procedure** with department\_id = 101 and display the results.

**Expected Output** for department\_id = 101:

student_id	name	subject	grade
3	Charlie	Algorithms	92
3	Charlie	Data Mining	95
1	Alice	Databases	85
1	Alice	Networking	89

**Submit your stored procedure code, the call statement, and screenshots of the results from running the procedure.**

#### Lab Question – 4

You are working with the following tables containing world country data:

##### 1. Countries

country_id	country_name	region	population
1	United States	North America	331002651
2	United Kingdom	Europe	67886011
3	Australia	Oceania	25687041
4	Germany	Europe	83783942
5	Democratic Republic of Congo	Africa	89561403
6	Brazil	South America	212559417

##### 2. Cities

city_id	city_name	country_id	population
1	New York	1	8419600
2	London	2	8982000
3	Sydney	3	5230330
4	Berlin	4	3769000

5	Kinshasa	5	14826000
6	São Paulo	6	12300000

##### **Task:**

- Write a query** to retrieve the country\_name (aliased as Country), region (aliased as Region), and population (aliased as Total\_Population) of all countries whose:
  - Name contains the word "United".
  - Region starts with the letter "N" or ends with "ica".
- Modify the query** to also retrieve cities where:
  - The city\_name contains the letter "o" anywhere within the name.
  - The city population is more than 5 million.
- Use a JOIN** statement to combine Countries and Cities and display the country\_name, city\_name, and city population, where:
  - The city name starts with "S" and ends with a vowel (e.g., "Sydney").
  - The country\_name has more than 10 characters and includes a space.
- Apply Aliases:**
  - Alias country\_name as Country\_Name.
  - Alias city\_name as Major\_City.
  - Alias population as City\_Population in the output.

**Sample Data Analysis:** Using the sample data, your queries should:

- Identify "United States" and "United Kingdom" for countries with "United" in the name.
- Filter regions starting with "N" or ending with "ica" (e.g., "North America", "Africa").
- Include "São Paulo" for city names starting with "S" and ending in a vowel.

**Expected Results** for Part 3:

Country_Name	Major_City	City_Population
United States	São Paulo	12300000
Democratic Republic of Congo	Kinshasa	14826000

**Submit your SQL code, results of the queries, and screenshots of the outputs.**