**Final Exam**

Classroom: Online

Assignment Points: 25 points

**Name:**

**Student ID:**

**Exam rules:**

* You MUST submit this final exam by **5/4/2023, 11:59 pm.** There will not be any extension or late submission.
* Submission: submit in **Canvas in pdf or word doc**.
* This is open book exam, and any kind of resource materials are allowed.
* Collaborations and consultations are NOT allowed. Do your own work.

**Section 1: 3 points**

1. During normalization process, we tend end up with more tables than we started?

A. True

B. False

2. You should remove partial dependency of non-Key attributes on the entire key in which normalization form?

A. First Normal Form

B. Second Normal

C. Third Normal Form

D. Fourth Normal Form

3. Which one of the following is used to create/define table and alter the of the structure in relational database system?

A. DML (Data Manipulation Language)

B. DDL (Data Definition Language)

C. Query

D. Relational Schema

4. A composite primary key may have a null value so long as other candidate keys remain not null.

A. True

B. False

5. Which of the following clause is used to filter the conditions in the SQL statement?

A. THEN

B. WHILE

C. WHERE

D. IF

6. Which SQL keyword is used to sort the result-set?

A. ORDER BY

B. ORDER

C. SORT BY

D. SORT

7. The BETWEEN operator is inclusive: begin and end values are included.

A. True

B. False

8. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ operator is used to match a specified pattern in a SQL statement.

9. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ is the process to eliminate data redundancy and to make functional dependency of attributes.

10. The complete SQL statement may be complicated but it must include at least these two keywords: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_, \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

11. Write a SQL statement to select the unique "LastName" column from the "Students" table?

12. Write a SQL statement to select all the records from a table named "Characters" where the ‘FirstName’ starts from ‘A’ or ‘B’.

13. Write a SQL statement to select all the records from a table “Customers” where the “LastName” ends with “c”.

14. DELETE FROM supplier statement does the following:

A. Delete all rows in the supplier table, including the table structure

B. Delete all rows in the supplier table

C. No data is deleted without WHERE clause

D. Delete the first row in the supplier table

15. In GROUP BY SQL statements, you remove groups that do not meet the conditions with the use of:

A. WHERE clause

B. HAVING clause after GROUP BY

C. WHERE clause first, and then use the HAVING clause

D. HAVING clause first, and then use the WHERE clause

**Section 2: 3 points**

Normalize the following form into **3NF.** Only your 3rd NF will be graded.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **University Department Sample Form** | | | |  |
|  |  |  |  |  |
| Dept Name | Hollywood |  |  |  |
| Phone 1 | 123-456-1111 |  |  |  |
| Phone 2 | 123-456-1112 |  |  |  |
| Phone 3 | 123-456-1113 |  |  |  |
|  |  |  |  |  |
| CourseID | Course Name | InstructorID | Instructor Name | Gender |
| 1 | Mission Impossible | EH\_123 | Ethan Hunt | M |
| 2 | Star Wars | RS\_456 | Rey Skywalker | F |
| 3 | Iron Man | TS\_789 | Tony Stark | M |
| 4 | Black Widow | NR\_012 | Natasha Romanoff | F |

This is the University departments sample form used by many departments.

If there is no concatenated key or many to many relationships, you may not need 2nd NF.

Do not carried away with unnecessary normalization.

**Assumptions:**

Department may have many phones and it offers many courses.

Each course belongs to only one department.

Each course is taught by only one instructor.

Hints:

List all attributes.

Identify repeating group of attributes.

Create proper entities and keys e.g., PK/FK to form relationship.

Make sure to create PK, if there is no obvious candidate key for PK.

Resolve transitive dependency, if any.

**Section 3: 3 points**

Create **ERD design** for following scenario:

Your data model design (ERD) should include relationships between tables with primary keys, foreign keys, optionality, and cardinality relationships. Captions are NOT required.

**Scenario:** There are 3 tables with 2 columns in each table:

**Department (** Dept ID, Department Name )

**Employee (** Employee ID, Employee Name )

**Activity (** Activity ID, Activity Name )

Each Employee must belong to ONLY ONE Department.

Department may have ZERO, ONE OR MORE Employees, i.e., Department may exist without any employee.

Each Employee may participate in ZERO, ONE OR MORE Activities

Each Activity may be performed by ZERO, ONE OR MORE Employees.

**Section 4: 2 points**

1. Create table **T1** with following columns and constraints.

Note: DO NOT use alter table, list all constraints while creating table.

C1 INT Primary key

C2 INT

C3 INT

C4 VARCHAR (40)

**Constraints:** C3 NON-ZERO, C2 greater than C3, C4 default value of 'HR'

1. Create table **T2** with following columns and Foreign Key.

Note: DO NOT use alter table, create FK while creating table.

C5 INT Primary key

C6 INT

FK on C6 column referencing to C1 column in table T1 above.

**Section 5: 7 points**

All questions are based on below **Employee** table:

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **EmpId** | **ManagerId** | **Name** | **Department** | **Salary** | **City** |
| 1 | 0 | Alex Smith | Admin | $90,000 | Boulder |
| 2 | 1 | Amy Mars | Admin | $50,000 | Longmont |
| 3 | 1 | Logan Mars | Admin | $70,000 | Longmont |
| 4 | 1 | James Mont | Marketing | $55,000 |  |
| 5 | 6 | John Smith | Marketing | $60,000 | Boulder |
| 6 | 1 | Lily Mars | Marketing | $95,000 |  |
| 7 | 6 | Ravi Grace | Database | $75,000 | Longmont |
| 8 | 6 | Tara Frank | Database | $80,000 | Longmont |
| 9 | 6 | Tom Ford | Database | $65,000 |  |
| 10 | 6 | William Cruze | Database | $85,000 | Longmont |

1. Write a SQL statement to find the Name and Salary who has **5th HIGHEST** Salary in the entire Employee table.
2. Write a SQL statement to find the Department and their count whose count is more than 3.
3. Write a SQL statement to show Name, Department and City.

However, if City is NULL, then display 'Broomfield' otherwise display City itself.

1. Write a SQL statement to find distinct employee Name who is also a manager.
2. Write a SQL statement to show Name, Department and Salary who earn MORE THAN the Average Salary in **THEIR department**. You must use sub-query.
3. Write a SQL statement to show Name, Department, Salary and their Rank **WITHIN Department** from highest to lowest salary.

i.e., Salary rank must reset and re-rank start from 1 for EACH Department.

1. Write a SQL statement to find HIGHEST paying employee’s Name and Salary from the entire Employee table. You must use sub-query.

**Section 6: 5 points**

All questions are based on below **Student** table:

**Student**

|  |  |
| --- | --- |
| **Attribute** | **Datatype** |
| StudentID | Int |
| FirstName | Varchar(40) |
| LastName | Varchar(40) |
| DOB | Date |
| City | Varchar(40) |
| Country | Varchar(40) |

a. Write a SQL to select all records (\*) from student table but exclude TEST students. TEST Students define as studentid ends with 999 (e.g., 123999) OR (firstName = TEST\_Student and lastname = TEST\_Student).

b. Write a SQL to find the difference between total count of city and unique (distinct) count of city from Student table. Show the difference as ‘difference’.

c. Write a SQL to find longest and shortest length cities and their length from Student table. Your sql result should display city and city\_length columns, sort by longest first and shortest second.

d. Write a SQL to show unique (distinct) city that starts with a vowel (a,e,i.o,u).

e. Write a SQL to show students count by age\_group from student table.

age\_group: if students age < 18 is ‘minor’ else ‘adult’. Your SQL result should show age\_group (minor/adult) and their count.

**Section 7: 2 points**

Create a Retail Sales Company **Data Warehouse design** using **STAR schema** from following info. Make sure to indicate proper \_DIM and \_Fact tables and their PKs/FKs. You need to join those tables using JUST straight lines (optionality and cardinality relationships are NOT required).

Date, Month, Year, SupplierName, SupplierCountry, ProductName, ProductCategory, CustomerName, CustomerCity, SalesItem, SalesPrice, SalesQty, SalesAmount

Note: You may use any tool or just handwritten to create STAR schema data warehouse design.

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