**CSCE 4523 Introduction to Database Management Systems**

**Spring 2024**

**HW 2**

**Due: Friday, March 1, 2024, 11:59 PM**

**Tutorial/Example**

Open a web browser and visit: [RelaX : Relational Algebra Calculator](https://dbis-uibk.github.io/relax/landing)A screenshot of a computer

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Click on Get Started.

Select the Wikipedia data set.

You can see the database contents and a good description of relational algebra in: [Wikipedia Relational Algebra](https://en.wikipedia.org/wiki/Relational_algebra)

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You may only have 1 query in the window at a time. Test out an easy query using project to see the contents of the Employee Relation. Use your mouse to copy/paste the π. When you are done entering the query, click on “execute query” to see the results.

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Delete that query and create queries for the following questions. When you are done, add a screenshot of your final query and results (similar to above) to a Word document or pdf to turn in for each of the following questions.

**Question 1**

Create a relation that shows the Employee.Name, Dept.DeptName, and Dept.Manager name for all employees in the Sales department.

**Question 2**

Create a relation that contains, for each Dept, the DeptName and count of employees that work in that dept.

**Question 3**

Create a relation that contains, for each Employee, their Name, their DeptName, and their Manager’s name (or null if they have no manager)

**Questions from the textbook: Brief, point form answers are fine**

**1.4**Describe the main characteristics of the database approach and contrast it with the file-based approach.

**2.1** Explain the concept of database schema and discuss the three types of schema in a database. (Also known as ANSI-SPARC Three-Level Architecture)

**3.11** Discuss the five essential characteristics of cloud computing.

**4.1** Discuss each of the following concepts in the context of the relational data model:

**(a) Relation:**

**(b) Attribute:**

**(c) Domain:**

**(d) Tuple:**

**(e) Degree:**

**(f) Cardinality:**

**4.5** For the schema below, list the primary key, candidate keys, and foreign keys (if any):

Student (ID, StudentFirstName, StudentLastName, StudentAddress, AdvisorID)

Primary Key:

Candidate Keys:

Foreign Key(s):

Advisor (AdvisorID, AdvisorFirstName, AdvisorLastName, AdvisorAddress)

Primary Key:

Candidate Keys:

Foreign Key(s):

* 1. Consider the relations that would be produced by the following relational algebra operations using the schema from chapter 4 (also shown below). Which attributes would the resulting tuples have? What would an informal interpretation of the relation contents be?

Hotel (hotelNo, hotelName, city)

Room (roomNo, hotelNo, type, price)

Booking (hotelNo, guestNo, dateFrom, dateTo, roomNo)

Guest (guestNo, guestName, guestAddress)

b) Hotel.hotelNo  Room.hotelNo(Hotel  Room)

d) Guest (dateTo ≥ ‘1-Jan-2007’ (Booking))

e) Hotel Hotel.hotelNo  Room.hotelNo (price  50 (Room)) )

5.12 Using the same schema as above, generate the relational algebra expressions for the following queries:

b) List all single rooms with a price below £20 per night.

d) List the price and type of all rooms at the Grosvenor Hotel.

g) List the guest details (guestNo, guestName, and guestAddress) of all guests staying at the Grosvenor Hotel on February 14, 2024.