Instructions:

Maximum points (50 points)

Section A: 20 points (Answer all questions)

You have 8 questions (Q1-Q8) answer all.

Section B: 30 points (Answer any two out of the three questions)

Consists of:

Q9 (9.1, 9.2, and 9.3)

Q10(10.1, and 10.2)

Q11(11.1, and 11.2)

Choose to answer any 2 questions in entirety (i.e. Q9 and Q10, Q10 and Q11, or Q9 and Q11). Ensure you attempt all sub-questions.

You will be expected to upload your answers in the form of PDF format only.

Using Grade Scope – You can attempt the examination between (Wednesday Jan 12, 2022@ 8 am to Wednesday Jan 12, 2021@6 pm).

Once you have attempted you have 90 mins to finish your exam.

No plagiarism.

ALL THE BEST

Assume a schema consists of two relations DEPARTMENT(DID, D\_name, Chair) and COURSE (CID, Dept, C\_name). Consider the following expressions:

(a) $$ \Pi\_{DID,Chair}(\sigma\_{CID=430}(DEPARTMENT \times COURSE) ) ) $$

(b) $$ (\Pi\_{DID,Chair}(DEPARTMENT))\bowtie\_{DID=Dept} (\sigma\_{CID=430}(COURSE) ) $$

Are algebraic expressions (a) and (b) equivalent? Use no more than two sentences to explain your answer

Below are definitions for the listed formal relational model terminologies:

i. Data Model: a set of concepts to describe structure of a database and constrains that the database should obey.

ii. Attributes: the various properties of an entity stored in a relation.

iii. Relation: a set of tuples that is stored as a table.

iv. The "Degree" of a relation refers to the number of participating attributes that define an entity.

( ) i, ii, and iii are TRUE

( ) ii and iv are TRUE

(X) ii, iii, and iv are TRUE

( ) i, ii, and iv are TRUE

( ) All are TRUE

In your own words state the difference between the following pairs of relational algebra operators?

Natural Join $$(\bowtie)$$ :: Cartesian Product $$( \times)$$

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Heterogeneous DDBMS :: Federated DDBMS

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Primary Key :: Foreign Key

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It’s a good practice to choose a primary key of a relation such that it satisfies:

( ) Uniqueness i.e., uniquely identify every tuple (or row) in a relation (or entity)

( ) Minimality, i.e., is the smallest key in the set of possible keys in the set of Super keys

(X) Both Uniqueness and Minimality

( ) None of the above

We define Logical Data Independence as the capacity to change the conceptual schema without having to change external applications.

(X) TRUE

( ) FALSE

Enumerate four types of constraints on a schema in a database.

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Consider the two tables T1 and T2 shown below

T1

P Q R

10 a 5

15 b 8

25 a 6

T2

A B R

10 b 6

25 c 3

10 b 5

Show the results of the following operations:

$$ T1 \times T2$$

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$$ T1 \bowtie T2$$

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The concept of foreign keys in DBMS enables which of the following?

(X) The creation of a database with more than one relation

( ) The ability to connect multiple databases together

( ) Both a and b

( ) None of the above

SECTION B

\_\*\*Answer Questions 9.1, 9.2, and 9.3\*\*\_

An E/R diagram when converted to the schemas gives rise to the following:

$$R(\underline A,B,C)$$

$$S(\underline A,\underline D)$$

$$T(\underline D,F,G)$$

Assume that an alphabet refers to the same attribute in different relations and vice versa (e.g., the alphabet A in the relations R and S are the same).

Given the schemas of R, S, and T create the E/R diagram?

\*\* NOTE: You should have two diagrams (a) establish mapping that exists between R, S, T, and (b) the conceptual diagram. For full credit draw them both.\*\*

\*\*Submit your answer as a PDF file (a photo of your answer in the pdf file format will work) \*\*

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Consider the following schemas:

$$ SUPPLIER (\underline{sid: integer}, sname: string, address: string)$$

$$ PART(\underline{pid: integer}, pname: string, color: string)$$

$$ CATALOG(\underline {sid: integer, pid: integer}, cost: real)$$

The primary key fields are underlined, and the domain of each field is listed after the field name. The CATALOG schema lists the prices charged for PARTs supplied by SUPPLIERs.

Write the corresponding DDL statements to create the above schema.

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The primary key fields are underlined, and the domain of each field is listed after the field name. The CATALOG schema lists the prices charged for PARTs supplied by SUPPLIERs.

Write the equivalent SQL expression for the following:

$$ \Pi\_{pid}(\sigma\_{(color='red' \vee color='green')} (PART \times CATALOG))$$

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\_\*\*Answer Questions 10.1 and 10.2\*\*\_ (10,5)

Draw an E/R diagram to model project groups in CSC430. Each student enrolled in CSC 430 is identified by a unique SID. Students work in groups of no more than 3 members. Each group works on one project. Each project is identified uniquely by its title, and can have more than one groups working on it. Be sure to identify the appropriate multiplicity and referential integrity constraints in the diagram. Indicate key attributes in each entity set.

\*\*Submit your answer as a PDF file (a photo of your answer in the pdf file format will work) \*\*

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Consider the following subset of SRS requirements gathered of a Conference Management System:

\*\*SR1.\*\* A paper is reviewed by at least 3 reviewers.

\*\*SR2.\*\* A reviewer can to review no more that 3 papers, and has to review at least one paper to be called a reviewer.

\*\*SR3.\*\* A reviewer may accept or reject or be neutral towards a paper.

\*\*SR4.\*\* Based on reviewer comments, PC chair prepares a set of papers of acceptance.

\*\*Draw the corresponding ER-diagram that captures the SRS requirements listed above. \*\*

\*\*Submit your answer as a PDF file (a photo of your answer in the pdf file format will work) \*\*

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\*\*\_Answer Questions 11.1 and 11.2\_\*\* (7,8)

Consider the relational database whose schema is shown below:

$$ EMPLOYEE (\underline{Emp-ID}, E-name, gender, DOB, disability, health-status)$$

$$COMPANY (\underline{company-name}, tax-ID, company-status)$$

$$Lives (\underline{Emp-ID}, street, city)$$

$$Works (\underline{Emp-ID, company-name}, salary)$$

$$Located-in (\underline{company-name}, city)$$

The primary key for each relation is denoted by the underlined attribute.

Write the DDL commands to create a database called ‘LA-NGO-Database’.

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$$Lives (\underline{Emp-ID}, street, city)$$

$$Works (\underline{Emp-ID, company-name}, salary)$$

$$Located-in (\underline{company-name}, city)$$

The primary key for each relation is denoted by the underlined attribute.

Write the following queries in \*\*Relational Algebra\*\*:

a. List the names of all female employees, who work for the ‘Ruston Bank’ (a unique company name in the database).

b. List all the companies who are in located-in the same city of the company ‘Ruston Bank’.

c. List the name of all employees who work for the ‘Ruston Bank’.

d. List the personal information of name, street, and city of all employees who work for the ‘Ruston Bank’ and earn more than $10,500.

\*\*Submit your answer as a PDF file (a photo of your answer in the pdf file format will work) \*\*

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