Islamic University of Technology

Organisation of Islamic Cooperation (OIC)

Department of Computer Science and Engineering (CSE)

MID SEMESTER EXAMINATION **WINTER SEMESTER, 2018-2019**

Duration: 1 Hour 30 Minutes **Full Marks: 75**

CSE 4307: Database Management Systems

Programmable calculators are not allowed. Do not write anything on the question paper. There are 4(four) questions. **Question No. 1 is compulsory to answer.** Answer any 2 from the remaining questions. Figures in the right margin indicate marks.

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1. (**Compulsory**) Government of Bangladesh plans to digitalize its different sectors. Each of the following questions are based on a description of the desired system of a particular component and a number of tasks are identified. The components are logically connected. *You may add additional attribute only if it is needed.*

   (a) A national database should be maintained to store the basic information of each citizen such as `Name, Date of Birth (DOB), Blood Group, Address, Profession.` There are two positions of conflicts of entity Vs. attribute choice for `Blood Group` and `Profession` as given bellow: [6]

   Position A: Both Blood Group and Profession should be attributes.
   Position B: Both Blood Group and Profession should be entities.

   Tasks: Justify your position. Make Entity Relationship Diagram (ERD) specifying the cardinality explicitly. Finally make the DDL statements corresponding the ERD.

   (b) We want to store and maintain citizens' driving license information such as `Name of Citizen,Address, Date of Birth,License No, License Issue Date, License Expire Date`. Each Citizen may have at most one driving license. [6]

   Tasks: Design the ERD without any data redundancy, mention the cardinality.Comment on if the participations are *total* or *partial*. Make the equivalent DDL statements.

   (c) Now medical sector should be connected to this system. To achieve this the information of each hospital should be maintained including `Name of Hospital, Location, Year of Establishment, Total Capacity` Citizens may be admitted to any of these hospitals but his time and reason for admission must be stored. [6]

   Tasks: Draw the ERD explaining the cardinality involved here. Write the DDL statements to reflect the ERD.

   (d) Based on the above design write the SQL statements for the followings: [2+2+3=7]

   i. Find out the list of citizens ID, name, date of birth, age in years (not given as entity attribute), whose names begin with 'a' and end with 'n' (in both cases letters are not case-sensitive).

   ii. Find the citizen ID, Name and Name of the profession.

   iii. Find a list of top 10 professions along with its total number of people (based on total number of people involved in the profession). A profession must have at least 1000 people involved to be considered primarily.

2. (a) *Atomicity problems* and *concurrent-access anomalies* are considered as the major drawbacks of traditional file processing system compared with relational database management systems. Briefly explain with examples. [8]

   (b) i. Define super key, candidate key, primary key and foreign key. Support the definitions using suitable example data. [6]

ii. What guideline will you follow in constructing a primary key of an Employee Management System? [3]

(c) *Primary key ensures two important purposes.* Mention them. *Foreign key, on the other hand, prevents the insertion of erroneous data as well as it removes redundancy.* Explain with example. [8]

3. (a) Consider the following description:
A library stores books information such as book title, author name, publisher name, area of study. Area of study can be organized in 2 levels (e.g. Level 1: Computer Science, Level 2: Algorithm, Database etc.). Publishers are well-known along with some additional information such as Name, Established Year, Country of origin, reputation. Multiple copies of a book must be stored efficiently. Now students can borrow and return books. Assume students basic information such as ID, Name, Department.

i. Draw the ERD for the above scenario. [5]

ii. Write the DDL statements for the above ERD. [5]

(b) What is the basic difference between inner join and outer join? Explain with example. [5]

(c) Is there any difference between a table and a view? Explain briefly. Mention the conditions that allow data insertion into a view. [5]

(d) Mention the major integrity constraints on a single relation. Issue one DDL statement involving the integrity constraints you have mentioned. [5]

4. (a) Define Cartesian Product and Natural Join. *Cartesian Product many produce many meaningless records while Natural Join removes them and retains only meaningful records* - Justify with example data. [8]

(b) Mr. Db Hall is a database designer of a very large company comprising 50000 employees. As part of the total system design he has done the following in regard to employees information: [8]

The total salary of each employee is calculated as follows:

```
Total Salary= Basic + 30% of Basic (as house rent)
```

Mr. X designed emp entity as follows:

```
emp(ID,Name, Date of Birth, Join Date, Age, Basic Salary, House Rent, Total Salary)
```

In order to make employee ID more informative he designed the ID as follows:

```
ID: X-NNN   where X is either L1 or L2 or L3, NNN is a 3-digit number.
```

Here L3, L2 and L1 stand for Senior, Medium and Junior employees. An employee has L3 status if he/she worked more than 10 years, L2 status if he/she worked more than 5 years and less than 10 years, others are with L1 status.

Tasks: This design has some benefits. Briefly mention them. But at the same time Mr. Db Hall has made some design problems in this context. Your task is to explain the major design problems and at the same time propose an idcal solution to eliminate those problems.

(c) Classify the constraints on generalization or specialization based on: i)Attribute of higher-level entity determines lower-level entity membership ii)The number of branching in its lower-level entity and iii)Completeness [9]