ISLAMIC UNIVERSITY OF TECHNOLOGY (IUT)
ORGANISATION OF ISLAMIC COOPERATION (OIC)
Department of Computer Science and Engineering (CSE)

MID SEMESTER EXAMINATION WINTER SEMESTER, 2022-2023
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.
Answer **all 3 (three)** questions. Figures in the right margin indicate full marks of questions whereas corresponding CO and PO are written within parentheses.

1. a) "Cartesian Product is a superset of Natural Join." - Justify with suitable example. 5 (CO1) (PO1)

   b) What is the basic purpose of providing "data abstraction" in Database Management System? There are broadly 3 levels of abstraction. Briefly describe them. 5 (CO1) (PO1)

   c) Differentiate between "table" and "view". Mention two important purposes of creating a view. 5 (CO1) (PO1)

2. Considering the requirements of the 3 relational tables as shown in Table 1, 2 and 3,

Table 1: Information about `Department` table for Question 2.

Attribute	Meaning and Requirement
DID	Primary key
Dept Name	can not be empty
Establishment Year	Exactly 4 digits with no decimal part

Table 2: Information about `Employees` table for Question 2.

Attribute	Meaning and Requirement
EID	Primary key, it is exactly a 6-digit number without any decimal part
Name	20 characters long irrespective of language
DOB	Date of Birth, must not be empty
Dept	Foreign Key referencing Department and it can not be empty
Blood Group	Must be any one from A+,A-, B+,B-,AB+,AB-
Salary	Monthly salary, must be greater than 5000
ManagerID	ID of his immediate reporting boss in the office,and he must be one of the existing employees
JoiningDate	

Table 3: Information about `Salary` table for Question 2.

Attribute	Meaning and Requirement
EmpID	Foreign key referencing Employees
PDate	Payment Date
Amount	Amount paid

a) Create the tables representing the information shown in Tables 1, 2, 3 using standard SQL. 10 (CO1) (PO1)

b) Write the SQL to answer the following queries: 5 × 2 (CO1) (PO1)

i. Find out the name, date of birth and name of the department of all employees who joined in the last 2 months (i.e. 60 days).

ii. Generate list containing department name and its total employees but include the department with at least 20 employees.

iii. List the employees name,yearly salary and name of their employer.

iv. A list containing department name and its total employees but include the department with at least 20 employees and whose departmental average salary is greater than 20000.

v. List 2 departments with the highest and the lowest number of employees.

c) Consider there exists two relations *R*1 and *R*2. Mention the two conditions must be met in order to execute UNION operation. Is it possible to get inconsistent records even if these two conditions are satisfied? Justify your position using example data. 10 (CO1) (PO1)

3. Consider the following high-level description of a sales company:

ABC is a large company that sells different electronic items, such as: Laptop, Smart Phone, Smart Watch, etc. Each item has its name, a short description, and unit price. The country has a number of divisions. Each division has a number of districts. The company has branches at different districts of the country. Employees have basic information, such as name, DOB (date of birth), contact number, and current branch location (i.e. division and district). The company has a number of departments, such as sales, accounts, admin. Each employee must be attached to a specific department. Only customers who are pre-registered with basic information such as name, contact numbers, and address can buy items. The company also provides rental service for items, such as laptop/smart phone for its employees for a specific time duration. After the duration, items must be returned.

Based on the scenario, answer the following questions:

a) Draw the Entity-Relationship Diagram (ER-D) using the standard notations and symbols. 15 (CO2) (PO3)

b) Implement the ER-D from Question 3.a) using standard SQL. 15 (CO2) (PO3)

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MID-SEMESTER EXAMINATION — WINTER SEMESTER, 2021-2022

DURATION: 1 HOUR 30 MINUTES — FULL MARKS: 75

CSE 4307: Database Management Systems

Answer **all 3 (three)** questions. Marks of each question and corresponding CO and PO are written in the right margin with brackets.

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1. a) *"In a traditional file processing system it is hard to provide user access to some, but not all, data."* Explain using suitable example. **10** (CO1) (PO1)

   b) Is there any difference between schema and instance in relational database area? Explain. Consider the following records: **4 + 6** (CO1) (PO1)

Table 1: Employees data for Question No. 1.(b)

Name	Address	DOB
m	a	1-1-87
n	b	2-4-82
q	a	1-12-80
r	f	3-4-79

Now, deduce its super keys, candidate keys, and primary key for the given records. Present suitable arguments for finalizing the primary key.

   c) What is domain of attribute? How can you ensure it in implementation phase? Explain with example. **5** (CO1) (PO1)

2. a) Consider the following SQL statement to list all employees name, address and their total salary where total salary is calculated as the sum of his/her basic and bonus amount (if any): **5** (CO1) (PO1)

```
select Name, address, (salary+bonus) Total
from emp;
```

It was observed that the values for total salary for a number of employees were displayed as 0 but each of employees monthly salary has been found correct.

Your task is to identify and explain the most probable cause of the above result. At the same time, provide a suitable solution to get rid of such error.

   b) Consider the following entities (note: here pk means primary key, fk[x] means foreign key referencing entity x): **2 × 5** (CO1) (PO1)

- `Depts(Name(pk),Location,Budget)`
- `Students(SID(pk),Name,CGPA,Dept(fk[Depts]))`
- `Teachers(TID(pk),Name,Designation, Dept(fk[Depts]) )`
- `Supervisors(TID(fk[Teachers]),SID(fk[Students]),ProjectName)`

Write SQL statements for the following queries:

i) List of departments name, location, and total number teachers for each department.

ii) List of the students with ID, name, their dept name, and dept location only for those departments that are located at "Academic Building 2".

iii) List of teachers with their name, designation, and the total number of students they are supervising.

iv) List of teachers with their name and designation who are supervising at least 5 students.

v) List of top 3 department name, location and the total number of students (ranking is based on total number of students)

c) What is the basic purpose of a materialized view? Consider the following 2 view definitions: **5** (CO2) (PO2)

```
create or replace view empV
as select id,name, salary/12 as monthlySalary
from emp;

create or replace view studentV
as select id,name,dob,cgpa
from students;
```

Is it allowed to insert data through these views? Justify your choice. (assume the tables `emp` and `student` exist with the mentioned attributes in the view definitions)

3. Read the following user requirement in the context of automation of Bangladesh NID, driving license and treatment history:

National ID (NID) is an integrated collection of citizens' information such as Name, Date of Birth, Occupation, Blood Group. Each citizen has his/her own NID. In order to investigate the population density, the country has been divided into divisions. Each division has its name, size (in square kilometer) and a brief description. Again each division has a number of districts with similar attributes. Citizen information must be connected to its corresponding division and district.

Each citizen may have exactly one driving license where information such as type of license, issue date, and expiration date are maintained. Whenever any accident occurs, it is logged in the central system. The system stores relevant information such as date and time of accident, location of accident, and the number of deaths (if any).

There are a number of hospitals in the country having names and contact information. Each hospital may have more than one contact number. Citizens may avail treatment in any hospitals they prefer. Whenever any patient (i.e. citizen) is admitted, the system keeps the record of his/her date of admission, a brief description, and release date.

a) Draw the Entity Relationship Diagram (ER-D) using conventional method. **10** (CO3) (PO3)

b) Write appropriate DDL statements to implement above ER-D. **10** (CO1) (PO1)

c) Write standard SQL for the followings: **5 × 2** (CO1) (PO1)

i Find the list of Districts along with its total population.

ii Find the list of Districts having at least 20000 people living there.

iii Find the number of accidents occurred (if any) by a citizen whose NID is 210.

iv Find the list of top 5 hospitals based on the number of patients admitted so far.

v Find the list of Divisions along with its total number of Districts for each Division.

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B.Sc. Engg. / HD CSE 3rd Semester (65)

10 March 2017 (Morning)

ISLAMIC UNIVERSITY OF TECHNOLOGY (IUT)

ORGANISATION OF ISLAMIC COOPERATION (OIC)

Department of Computer Science and Engineering (CSE)

MID SEMESTER EXAMINATION — WINTER SEMESTER, 2016-2017

DURATION: 1 Hour 30 Minutes — FULL MARKS: 75

CSE 4307: Database Management Systems

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There are **4 (four)** questions. **Question No. 3 is mandatory.** Answer any **2 (two)** from the remaining questions. Figures in the right margin indicate marks.

1. a) List five significant differences between a file-processing system and a DBMS. 10
   b) Define following terms with examples: 5
      i. relation ii. tuple iii. attribute iv. relation instance v. atomic domain
   c) What do you mean by Selection, Projection and Cartesian Product in relational algebra? 5
      Cartesian Product is a superset of Natural Join. Justify with suitable example.
   d) What do you mean by cascading delete? Explain with a suitable example. 5

2. a) Define super key, candidate key, primary key and foreign key. Now consider the following system description of a typical university automation: 10

   There are a number of departments in the University. Each department runs a number of programs. The students information system stores basic information of each students such as name, date of birth, address, father name, department name (i.e. CSE, EEE), program name (i.e. B.Sc. or HD).

   Your tasks are:
   i. Design the ERD and DDL for the required entities.
   ii. In each entity assume some values and mention them. Now justify your definitions using these values.

   b) In SQL set operations (i.e., UNION, INTERSECT etc.) the syntax demands one condition must be met. Describe it with example. Yet another condition is not related to syntax but to its interpretation/meaning. Explain it with a suitable example. 5

   c) What is the difference between inner join and outer join? Explain left outer join and right outer join with suitable example data. *"Natural join removes meaningless records."* Justify with suitable example. 10

[Mandatory to Answer]

3. a) Highlight the basic difference between SQL and C (or Java). Explain DDL and DML with suitable examples. 5
   b) Write SQL for the followings: 2×5
      i. List the division name and its size according to its size.
      ii. List the person ID and name who live in divisions that start with 'D'.
      iii. List the person ID and name who live in division with the largest size (in squire KM)
      iv. List the division name and its total inhabitants.
      v. List the division name and its total inhabitants where total inhabitants is at least 10000.

1To

c) Create Tables as described below: 10

Table: Division		
Attribute	Description and/or Data Type	Requirement / Other information
ID	Numeric with no decimal part.	Primary key
Name	50 characters	It may be used by other than English language such as Chinese.
Size	In Squire KM	Division size cannot be less than 20 squire KM

Table: Person		
Attribute	Description and/or Data Type	Requirement / Other
ID	Numeric with no decimal part.	Primary key
Name	50 characters	It may be used by other than English language such as Chinese.
DOB	Date	No date before January 1, 1950 is allowed.
DivisionCode	Foreign Key (Division)	It cannot be empty.
Salary	Monthly Basic Salary	May be null only for unemployed.
BloodGroup	Character	Any value from List{A+ve, A-ve, B+ve, B-ve, AB+ve, AB-ve}

Note that the table Person has only division information, in reality a division has a number of districts. How can you include district information in the person table? Explain.

4. a) Consider the following DDLs: 5

```
CREATE TABLE T1
(A NUMBER PRIMARY KEY,
B VARCHAR2(20));

CREATE TABLE T2
(X NUMBER,
Y DATE,
X NUMBER ( CHECK X IN (SELECT A FROM T1));
```

Although the check clause in the above DDL is theoretically valid, existing database does not support it. Justify with appropriate argument.

b) Consider a result processing system of a large university. The followings are some requirements given with pseudocode. Also some additional instructions (marked as I) are given. Your task is to convert the pseudo code to appropriate DDL satisfying the additional instructions. 10

```
Dept(ID, Name)
Prog(ID,Name)
```

I: Correct it so that it preserves *one to many* relationship.

```
Student(ID, Name, DOB, CGPA)
```

I: Make the DDL such that Student maintains one to many relationship with both Dept and Prog.

```
Emp(ID, Name, Dept)
```

I: Now create another entity to store the grades for the individual courses of each students. First justify its relationship (cardinality) and present your solution.

c) What is jdbc? Briefly explain SQL-injection. 5

d) What is the basic difference between a table and a view. State the conditions where a view cannot be updated. 5

B.Sc. Engg. CSE / HD CSE 3rd Semester — 14 March 2018 (Morning)

ISLAMIC UNIVERSITY OF TECHNOLOGY (IUT)
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MID SEMESTER EXAMINATION — **WINTER SEMESTER, 2017-2018**

DURATION: 1 Hour 30 Minutes — **FULL MARKS: 75**

CSE 4307: Database Management Systems

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There are **4 (four)** questions. **Question No. 2 is mandatory.** Answer any **2 (two)** from the remaining questions. Figures in the right margin indicate marks.

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1. a) File-processing system may introduce data redundancy and inconsistency. Explain it with a suitable example. 10
   b) Explain the usefulness of 1-1 cardinality using a real-life example. 5
   c) What is a sub-query (or nested query)? A sub-query can be placed in two places. Briefly mention them with suitable examples. 5
   d) What are Selection and Projection operations in relational algebra? Use a table with few records and show how these operations work. Is it possible to combine Selection and Projection? Justify it. 5

[Mandatory]

2. a) Define super key, candidate key, primary key and foreign key. Now consider the following system description of a typical bank automation: 3+6+7

Branch Part: ABC is a large bank with more than 150 branches all over the country. Each branch has its geographical location, year of establishment, total no. of employee and current manager name. But management also wants to preserve the history of mangers at different branches with these information: branch name, manger name, joining date, end date.

Account Part: Before opening account a customer must supply his/her basic information such as : name, DOB, address, phone and introducer. Introducer is an existing customer. There are 3 basic types of accounts such as i) Current ii) Saving and iii) Student. Each type is different only by one attribute (i.e. Interest Rate). Assume other attributes are identical. After fulfilling personal information he/she can open account with the following information: Account No, Title of Account, Owner of the Account (person), Type of Account (either of the 3 already mentioned). One person may have multiple accounts but he/she will fulfill the personal data only once.

Transaction Part: There are two basic types of transaction as such i) Deposit and ii) Withdraw. Each transaction must include the following information: transaction no, amount, type of operation, date time, account no.

Your tasks are now:

i. Design the ERD with appropriate cardinality. In each step comment on how your design satisfy the given requirements.
ii. Convert ERD into DDL using standard SQL (you should mention the appropriate primary key and foreign key in each definition).

3×3

b) Consider the following entities:

Depts(Code, Name)
Students (ID, Name,GPA, Dept (Foreign Key Referring to Depts))

Write SQL for the followings:

i. List the Student Name whose GPA is above the average GPA of the students.
ii. List the ID and Name of 2 students: one who got the highest GPA and the other one who got the lowest GPA. (A single list will show these two students information).
iii. List of Dept Name, Dept Code and total number of student of that department.

3. a) Differentiate between the followings using proper example data: 5

i. Cartesian Product and Natural Join ii. Left Outer Join and Right Outer Join

b) Create tables as described using standard SQL: 10

Table: Division		
Attribute	*Description and/or Data Type*	*Requirement / Other information*
ID	Numeric with no decimal part.	Primary key
Name	50 characters	It may be used by other than English language such as Chinese.
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Note that the table Person has only division information. In reality a division has a number of districts. How can you include district information in the person table? Explain.

c) Write SQL for the followings: 2×5

i. List the division name and its size according to its size.
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iii. List the person ID and name who live in division with the largest size (in squire KM)
iv. List the division name and its total inhabitants.
v. List the division name and its total inhabitants where total inhabitants is at least 10000.

4. a) What are total participation and partial participation? Explain with example. 5

b) Consider a result processing system of a large university. The followings are some requirements given with pseudo code. Also some additional instructions (marked as **I**) are given. Your task is to convert the pseudo code to appropriate DDL satisfying the additional instructions. 8

```
Dept(ID, Name)
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I: Make the DDL such that Student maintains one to many relationship with both Dept and Prog.

```
Emp(ID, Name, Dept)
```

I: Now create another entity to store the grades for the individual courses of each students. First justify its relationship (cardinality) and present your solution.

c) What are weak entity set and discriminator? Present an example in this regard.

d) Discuss the various ways to impose constraints on generalization.