EAST WEST UNIVERSITY
Department of Computer Science and Engineering
B.Sc. in Computer Science and Engineering Program
Theoretical Assignment I (Online), Spring 2021 Semester

Course:	**CSE 302 Database Systems**
Instructor:	**Mohammad Rezwanul Huq, Ph.D., Associate Professor, CSE Department**
Full Marks:	**100 (15 will be counted for final grading)**
Submission Deadline:	**Sunday, 28 March 2021, 11:59 PM**

Note: There are **7** (**SEVEN**) questions. Answer ALL of them. The Mark of each question is mentioned at the right margin.

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1. Assume that you are the owner of a very popular online grocery store. Every day, your store has thousands of transactions and therefore, inserting a lot of data into your database. [Mark: 08]

You are interested to find the buying patterns of your customer which is typically known market-basket analysis. As for example, customer may buy bread and butter together frequently; not of course bread and diaper together.

Which type of database users/professionals you want to hire for finding these patterns? Justify your answer briefly by using relevant terms.

2. Go to the website: https://surokkha.gov.bd/. This website is created for the registration of the COVID-19 vaccination. Visit the different pages on the website and try to understand how the registration system works. [Mark: 10]

Your job is to **draw a Schema Diagram** for this COVID-19 vaccination database as complete as possible. Mention your assumptions for this schema diagram, if any. Identify primary keys, foreign keys, and other necessary constraints along with the data type of different attributes.

3. Assume that there are two relations – r and s. [Mark: 15]
Relation r has p number of tuples, and relation s has q number of tuples.
Determine the maximum number of tuples that can be produced after performing the following operations.

a) $r \times s$ (Cartesian Product)

b) $r \bowtie s$ (Natural Join)

c) $r \cup s$ (Union)

d) $r \cap s$ (Intersection)

e) $r - s$ (Minus)

4. Consider the following database schema.   [Mark: 40]

- Hotels (hotelId, hotelName, hotelCity, hotelRating)
- Rooms (roomId, hotelId, roomType, roomPrice)
- Bookings (hotelId, guestId, checkInDate, checkOutDate, roomId)
- Guests (guestId, guestName, guestAddress, guestGender, guestAge)

Hotels relation contains hotel details, and hotelId is the primary key. hotelRating indicates the star rating of the hotel like 2, 3, 4, or 5.

Rooms relation contains room details for each hotel and (roomId, hoteIId) forms the primary key. roomType could be 'single,' 'double,' 'triple,' 'suite', and so on.

Bookings relation contains details of bookings and (hoteIId, guestId, checkInDate) forms the primary key. checkOutDate will be NULL if a guest is still staying at the hotel.

Guests relation contains guest details, and guestId is the primary key. guestGender contains 'M' for male, 'F' for female and 'T' for transgender.

Write both **Relational Algebra Expressions** and **SQL Statements** for the following queries.

a) List full details of all guests live in Delhi.

b) Find the names of the hotels in London with at least 3 star rating.

c) List the hotel name and hotel rating of those which have guests on or after '15-Feb-2021'.

d) Using the cartesian product, Find the name, age and gender of guests who are currently staying at 'Intercontinental' hotel.

e) Using the appropriate set operator, list guest id and the guest name who were never made a booking.

f) Find the room id and hotel id of the highest-priced room. (must use rename operator for relational algebra)

g) Find the average age of guests for each hotel.

h) How many rooms are there with price less than 200 in London?

5. Using the same database schema as given in Question 4, **write SQL statements**   [Mark: 12]
for the following queries.

a) Display all hotel booking information according to their check-in date in descending order.

b) Find guest id and guest name of those with 'Dhaka' as a substring in their address.

c) Find the average room price for each hotel. Do not include the hotels which have an average price less than 100.

d) Produce a report that shows full details of a room including roomId, hotelName, hotelCity, roomType, roomPrice and roomPrice after giving 10% discount. Rename the column header of the result relation appropriately. Tuples must be sorted in the descending order of room price. If two rooms have the same price, they must be sorted in the ascending order of hotel name.

6. Consider the following relational instance of the relation Team.   [Mark: 07]
The Team table shows the current points table of a football tournament.

teamId	teamName	Played	Won	Drawn	Lost	Points
1	team1	1	1	0	0	3
2	team2	2	0	1	1	1
3	team3	1	0	1	0	1

In the last match, team3 beats team1 by 1-0 goals. It is to be noted that, in a football match, the winning team gets 3 points, and the losing team gets none. If the game is drawn, both teams get 1 point each.

Write SQL statements to update the Team table accordingly.

7. Consider the following relations r and s.   [Mark: 08]

Relation r

A	B	C	D
a1	b1	c1	d1
a2	b1	c2	d3
a3	b3	c2	d1
a4	b3	c3	d2

Relation s

D	E	F
d1	e1	f1
d3	e1	f2
d4	e2	f2

Find the output of the following expressions.

a) r ⟕ s (Left Outer Join)

b) s ⟗ r (Full Outer Join)