EAST WEST UNIVERSITY
Department of Computer Science and Engineering
B.Sc. in Computer Science and Engineering Program
Mid Term Assessment I (Online), Summer 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)**
Time:	**1 Hour 20 Minutes + 10 Minutes for uploading the answer**

Note: There are **5** (**FIVE**) 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 trendy online grocery store. Every day, your store has thousands of transactions and, therefore, inserting a lot of data into your database. Finding some useful information out of this massive amount of data is a time-consuming task. [Mark: 10]

Which type of database user would you hire to do this job? How does that person could help you? Write your answer briefly using technical terms.

2. Assume that there are two relations – r and s. [Mark: 20]
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 **with brief explanation**. Without explanation, marks will be deducted. Write your assumptions, if any, to get the result.

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)

3. Consider the following database schema. [Mark: 20]

- Customer (CCode, CName, CGender, CAddress, CPostCode, CBalance)
- Vendor (VCode, VName, VAddress, VPostCode)
- Product (PCode, PName, PPrice, PDiscount, VCode)
- Invoice (InvoiceNumber, CCode, InvoiceDate)
- Cart (InvoiceNumber, ItemNumber, PCode, ItemUnits, ItemPrice)

Customer relation contains customer details and CCode is the primary key.

Vendor relation contains vendor (supplier) details and VCode is the primary key.

Product relation contains product details and PCode is the primary key. VCode is the foreign key referencing Vendor relation.

Invoice relation contains invoice details such as invoice number, customer code (CCode) and an invoice date. InvoiceNumber is the primary key and CCode is the foreign key.

Cart relation contains the products sold under a given invoice. The primary key in this relation is (InvoiceNumber, ItemNumber) in which item number is more like a serial number, i.e., 1, 2, 3 and so on, depending on the number of products sold under the same invoice. Invoice number is a foreign key referencing the Invoice relation and product code (PCode) is another foreign key referencing Product relation. Item units refers to the quantity of that item and ItemPrice refers to the price of the item.

Answer the following questions.
a) Draw the schema diagram of the above mentioned database schema.

b) Write a SQL Statement to create the Cart relation. Use appropriate data type. Define appropriate constraints. Make sure that ItemUnits and ItemPrice cannot be NULL.

c) Write a SQL Statement to add a new attribute CPhone in Customer relation. Use appropriate data type. Assume that the Customer relation is already created for you.

d) Write a SQL Statement to decrease the price of the product with code P1-AB-01 by 20%.

e) Write a SQL Statement to delete all the customers with a negative balance.

4. Based on the database schema given in Question 3, **Write SQL Statements** for the following queries.   [Mark: 25]

a) Show customer code and name who are 'female' and balance is not in between 10000 and 20000 (both bound are inclusive).

b) Generate a listing of all purchases made by customers according to the columns in the result relation shown below.

CCode	InvoiceNumber	InvoiceDate	PName	ItemUnits	ItemPrice

c) Show customer code, balance and total purchases for each customer. Total purchase is calculated by summing the multiplication of ItemUnits and ItemPrice for each customer (see structure of the result relation in question b.

d) Write a query to compute the total of all purchases, the number of purchases and the average purchase amount made by each customer. The number of purchases depends on the number of products in each invoice. If a customer has two invoices and in the first one there are 3 products and in the second one there are two products, then the total purchase will be 5.

e) Using the appropriate set operator, find the customer code and name of those customers who have not made any purchase yet.

5. Using the same database schema as given in Question 3, **write <mark>Relational Algebra</mark>** [Mark: 25]
Expressions for the following queries.

a) Show customer code and name who are 'male' and balance is in between 10000 and 20000 (both bound are inclusive).

b) Find the product code, product name and product price supplied by the vendor 'Samsung'.

c) Write a query to count the number of customers with the balance less than 5000.

d) Show the total number of purchases made under each invoice. The number of purchases depends on the number of products in each invoice. If an invoice has 3 items (products), then the count of purchases made under that invoice will be 3.

e) Using the appropriate set operator, find the product code and name of those products which has not been sold to any customer yet.