EAST WEST UNIVERSITY
Department of Computer Science and Engineering
B.Sc. in Computer Science and Engineering Program
Mid-Term Exam, Fall 2023 Semester

Course:	**CSE 302 Database Systems (Section – 2)**
Instructor:	**Mahmuda Rawnak Jahan, Lecturer, CSE Department**
Full Marks:	**60 (20 will be counted for final grading)**
Time:	**1 Hour and 30 Minutes**

Note: There are **6** (**SIX**) questions. Answer ALL of them. The Course outcome, Cognitive level, and Mark of each question are mentioned at the right margin.

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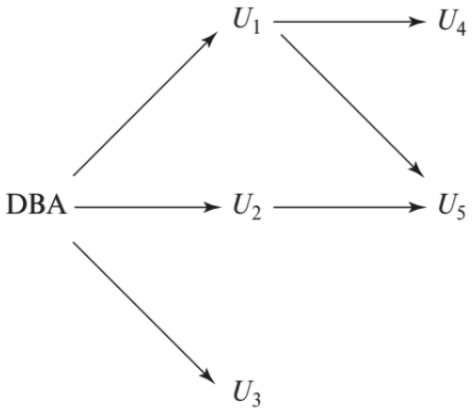
1. **Explain** the concept of candidate keys in a relational database. **Describe** how you determine which candidate key should be chosen as the primary key for a table? **Write** SQL statements to demonstrate how primary and foreign keys are defined using two relations. [CO1, Marks: 2+1+4=7]

2. [CO2, Marks: 2x4= 8]



Consider the above authorization graph showing the users having SELECT privilege on the previously created 'X' view.

a) Suppose, you're the database administrator (DBA), now write SQL statements to grant users U1, U2, U3 select authorization on the 'X' view.
b) If U2 revokes privilege from U5, does U5 still have access to the view? Draw the changed authorization graph in support of your answer.
c) If DBA revokes privilege from U1, does U4 still have access to the view? Draw the changed authorization graph in support of your answer.
d) Now write a SQL statement as the DBA to revoke the initially given privilege from U1.

3. Consider the following **Employee** and **Department** relations: [CO1, Marks: 2x4= 8]

Employee:

Emp_id	Emp_name	Dept_id
1	Alice	101
2	Bob	102
3	Charlie	103

Department:

Dept_id	Dept_name
101	HR
102	IT
104	SALES

Find the output of the following expressions:
a) Employee ⟕ Department (Left Outer Join)
b) Employee ⟗ Department (Full Outer Join)

4. **Formulate relational algebra expressions** for the following queries based on the ProductSales database schema as given in Appendix. The database schema is mentioned below again. [CO1, Marks: 3x5=15]

Product (product_id, product_name, category, price)
Order (order_id, customer_id, order_date)
OrderItem (order_item_id, order_id, product_id, quantity)
Customer (customer_id, customer_name, contact_number, address)

A. Find the product name, category, and price for the product with id P-2.
B. Find the product names and quantities for each order placed on '2023-11-21'.
C. Retrieve customer names and their total order quantity.
D. Retrieve the names of customers who have placed orders for products with a price greater than 500.
E. Find the customer names and contact numbers with the maximum number of orders.

5. **Construct SQL Statements** for the following queries based on the ProductSales database mentioned above. The database schema is mentioned below again. [CO2 Marks: 3x5=15]

Product (product_id, product_name, category, price) Order (order_id, customer_id, order_date) OrderItem (order_item_id, order_id, product_id, quantity) Customer (customer_id, customer_name, contact_number, address)

A. Retrieve the customer names who ordered 'Headphones'.
B. Retrieve the customer names and their total order amounts for each customer.
C. Retrieve the product names and prices of products with a price less than 100, ordered by customers with 'o' in their name.
D. Retrieve the customer names and addresses who have not placed any orders using a subquery in the WHERE clause.
E. Retrieve the names of customers who have ordered at least one product from the clothing category using the EXISTS clause.

6. Consider the above-mentioned ProductSales database schema as shown in Question 5. **Construct DDL Statements** in SQL for the following operations. [CO2 Marks: 2+2+2+1 =7]

(a) Add a new attribute, 'order_status', in the Order relation.
(b) Add a new constraint named 'ORDER_STATUS_CONSTRAINT' ensuring that the 'order_status' can only have the values 'Processing', 'Shipped', 'Done', or 'Canceled'.
(c) Update the order with id O-2 to set the 'order_status' to 'Shipped'.
(d) Delete the customer with id C-1.