

CS4.301: Data and Applications (Monsoon 2023)

Quiz - 2

Max Marks: 30

Time: 45 mins

Roll No:

Branch:

General Instructions:

- This question paper consists of 4 sections. All sections are **compulsory**.
 - There are **specific instructions** for each section. Please read those instructions carefully before answering the questions.
 - **Clearly specify the attributes, entities that you are using in your queries, any ambiguity may lead to deduction of marks.**
 - Papers without roll numbers will be **awarded 0 marks** for this quiz.
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Section - A

Instructions:

1. You have to write SQL statements for the given 4 queries.
2. **No partial marks** will be given in this section. (i.e. either full for the part or 0).

Consider the schema following two tables:

Order

Column Name	Data Type	Constraints
OrderID	INT	Primary Key
CustomerID	INT	
OrderDate	Date	
Price	INT	

Customer

Column Name	Data Type	Constraints
CustomerID	INT	Primary Key
CustomerName	Varchar(30)	

1. Set the default value of the **Price** column in the **Order** table as 10. (1)
2. Make the CustomerID column in the **Order** table a foreign key which references the CustomerID column in the **Customer** table. (2)
3. Change the data type of **Price** column in **Order** table so that decimal numbers can be inserted with a precision of 5 decimal places. (2)
4. Add a positive value constraint on the **Price** column in the **Order** table. (i.e. the price should always be > 0). (2)

Section - B

Instructions:

1. You have to write SQL statements for the given 3 queries.
2. Along with the SQL statement, you have to provide an **explanation** of your query.
3. It is compulsory to use the **JOIN** clause. Answers **without JOIN clause will be given 0 marks**.
4. If your query is correct you will receive full (4 marks) for that part. However, if your query is incorrect, then **you can get up to 2 marks for correct explanation/thought process**.

Consider the following database for an e-commerce platform:

- Customers (customer_id, customer_name, email_id, address);
- Products (product_id, product_name, cat_id, price, stock_quantity);
- Categories (category_id, category_name);
- Orders (order_id, c_id, order_date, total_amount);
- OrderDetails (order_detail_id, o_id, p_id, quantity, subtotal);

Referential Integrity Constraints:

- The cat_id column in Products refers to the category_id in Categories.
 - The c_id column in Orders refers to the customer_id in Customers.
 - The o_id column in OrderDetails refers to the order_id in Orders.
 - The p_id in OrderDetails refers to the product_id in Products.
1. Write a query to retrieve the total number of orders placed by each customer (the query should display customer_id, customer_name and number of orders placed for each customer). (4)

2. Write a query to find the top 3 categories with the highest total sales (sum of subtotal from OrderDetails) and display the category names and total sales. (4)
3. Write a query to find the top 5 best-selling products by the total quantity sold and show their ids, names and total quantity sold. (4)

Section -C

Instructions:

1. You have to write the number of tuples expected in the result of the given relational algebra expression.
2. Along with the answer, you have to provide an **explanation**.
3. Answers without an explanation will be **awarded 0 marks**.

Consider the following relations A, B and C.

A		
ID	Name	Age
12	Arun	60
15	Shreya	24
99	Rohit	11

B		
ID	Name	Age
15	Shreya	24
25	Hari	40
98	Rohit	20
99	Rohit	11

C		
ID	Name	Age
25	Hari	40
95	Aryan	18

1. Write the number of tuples expected and justify your answer. (2)

$$\pi_{name}(A \bowtie_{A.ID=B.ID} B) \cap \pi_{name}(B \bowtie_{B.ID=C.ID} C)$$

2. Write the number of tuples expected and justify your answer. (2)

$$\pi_{name}(\sigma_{A.age \leq 50}(A \bowtie_{A.ID=B.ID} B)) \cup \pi_{name}(\sigma_{C.age > 20}(B \bowtie_{B.ID=C.ID} C))$$

Section - D

Instructions:

1. There are **2 subjective questions** relating to database design concepts.
2. Please write **concise and correct** answers.

1. Consider the following schema:

Customer_Order_Details (CustomerID, Name, Address, Phone, Email, OrderID, Product, Quantity, Price)

What kind of modification anomaly can occur in this schema if we want to change the price of a product that has been ordered by multiple customers? Explain your answer with an example. (4)

2. Consider the following table:

StudentID	Name	Course	Grade
101	Alice	CS101	A
102	Bob	CS101	B
103	Carol	CS102	A
104	Dave	CS102	C
105	Eve	CS103	B
106	Frank	CS103	A

Which of the following functional dependencies may hold given the above state of the database? For the FDs that dont hold, give one counter example that shows its violation. (3)

- StudentID -> Name
- Name -> StudentID
- Course -> Grade
- Grade -> Course
- StudentID -> Course
- Course -> StudentID