Course Code: CS309
Information and Database Systems (IDS)
Assignment 9
Instructor: Dr. Rohit Saluja

Question 1: Consider the following implications relating to functional and multivalued dependencies given below. Mention with adequate reasons, whether each of the below mentioned implication is True or False.

i) if A->>B and A->>C then A->BC
ii) if A->B and A->C then A->>BC
iii) A->>BC and A->B then A->C
iv) A->BC and A->B then A->>C

Question 2: SQL allows tuples in relations, and correspondingly defines the multiplicity of tuples in the result of joins. Which one of the following queries always gives the same answer as the nested query shown below:

Nested Query: Select * from R where a in (select S.a from S).

Note: Here * means all columns.

(A) select R.* from R, S where R.a=S.a
(B) select distinct R.* from R,S where R.a=S.a
(C) select R.* from R, (select distinct a from S) as S1 where R.a=S1.a

Note: (C) has been checked, and it works fine. "(select distinct a from S) as S1" has tuples from relation S having distinct values for column "a".

Explain each of the options above with adequate examples, assume two relation tables R and S with some common values for common attributes and some distinct values for them.

Question 3:

i) Write an SQL query that combines the sales and returns data from two separate tables (sales and return) into a single result set. Include the product name, price, purchase/return date, and customer ID for each record. In the final result set, only include records for products that have been sold or returned at least once, Order the result set by the product name in ascending order. **[HINT: UNION]**

ii) Write an SQL query that combines the customer data from two separate tables (customers and new_customers) into a single result set. The new_customers table contains information on customers who have signed up for a new account since the last time the data was updated. In the final result set, include the customer ID, first name , last name, email, and a column indicating whether the customer is new or existing. Rename the new customers table table to customers_new, and the existing customers table to customers_existing. **[HINT: UNION All, Rename]**

iii) Write an SQL query that returns a list of unique product names from two separate tables (sales and returns. Order the result set by product name in ascending order. **[HINT:Use Distinct]**

Question 4:

Consider the following relation and functional dependencies. List the candidate keys with adequate reasons. Determine whether each of the given functional dependencies satisfies or violates 4NF. Write your answer with appropriate reasoning. Decompose the relation adequately based on the 4NF decomposition algorithm.

Student (Student_ID, Permanent_Address, Course, Hobby)

Student_ID -> Permanent_Address

Student_ID ->> Course

Student_ID ->> Hobby

Question 5: Consider a database that has the relation schema C (StudentName, and CourseName). An instance of the schema C and a SQL query on it are given below.

C	
StudentName	**CourseName**
AA	XA
AA	XB
AA	XX
AB	XB
AB	XX
AC	XA
AC	XB
AC	XX
AD	XA
AD	XB
AD	XX
AD	XD
AE	XD
AE	XA
AE	XB
AF	XA
AF	XB
AF	XX

The following query is made on the database:

$T1 \leftarrow \Pi_{CourseName}(\sigma_{StudentName = 'AA'}((C))$

T2 <- C÷T1

Perform the query and return the output in T2. Create a connection with mysql through python code and then execute the query. The sqlite3 library can be used for making the connection. Submit the applicable python file and mysql project along with the solution pdf in a zip file.