***Question 1***

a) ({1, 2, 3} ᴜ {5, 7, 11}) ∩ {2, 4, 6, 8, 10}

***Answer:*** {2}

b) ({1, 2, 3} ∩ {2, 4, 6, 8, 10}) ᴜ ({5, 7, 11} ∩ {2, 4, 6, 8, 10})

***Answer:*** {2} ᴜ {} = {2}

***Question 2***

A relation exists with 4 columns, named Column1, Column2, Column3, and Column4. Column1 is of type text. Column2, Column3, and Column4 are of type int:

1. Use relational algebra to fulfill the intent of the following SQL. • SELECT Column1, Column3 FROM MyTable WHERE Column2 = Column3

***Answer***: πColumn1,Column3(σColumn2=Column3(R)) Where R is MyTable

1. Reverse the order of projection and selection in your algebraic formulation from item 2a. What is the result of the new algebraic expression?

***Answer:*** σColumn2=Column3( πColumn1,Column3(R))

The result is going to be *same as 2a* because they are associative and commutative.

***Question 3:***

πc1, c2(σϕ1(σϕ2(πc1, c2, c3, c5(R))))

Where - ϕ1: C1 = C5; ϕ2: C5 = “Test”; R: MyTable;

1. Write a SQL statement that declares the intent of the algebraic notation

***Answer:***

SELECT C1,C2 FROM MyTable WHERE C5='Test' AND C1=C5;

1. Simplify the algebraic statement. Simplification means minimize the number of parentheses and terms.

***Answer***

πc1, c2(σϕ1(σϕ2(R)))) Where - ϕ1: C1 = C5; ϕ2: C5 = “Test”; R: MyTable;

***Question 4:***

SELECT \* FROM T1 JOIN T2 ON T1.C1 = T2.C1

1. Write out an equivalent in relational algebra using the join operator

***Answer:***

T1 ⋈ϕ T2 where ϕ: T1.C1 = T2.C1

1. Write out an equivalent in relational algebra without using the join operator

***Answer:***

σϕ(T1 X T2 ) where ϕ: T1.C1 = T2.C1

***Question 5:***

πS.C1, R.C2(σϕ1(R) ⋈ϕ2 S) where • ϕ1 = (R.C2 = ‘A’) • ϕ2 = (R.C1 = S.C2)

Write out equivalent SQL and test this SQL using relations R and S that you create for this example. The relations R and S in RelationalAlgebraAndSQL.pdf and RelationalAlgebraAndSQL.sql don’t quite work because their column types do not match for this assignment.

***Answer:***

SELECT S.C1,R.C2 FROM R JOIN S ON R.C1=S.C2 AND R.C2='A';

Based on below schema

-- Create Relations as operands for the operations

CREATE TABLE R (C1 nchar(1), C2 nchar(1));

CREATE TABLE S (C1 int, C2 nchar(1));

GO

TRUNCATE TABLE R;

GO

INSERT INTO R VALUES ('B', 'B');

INSERT INTO R VALUES ('A', 'A');

INSERT INTO R VALUES ('B', 'B');

INSERT INTO R VALUES ('A', 'A');

SELECT \* FROM R;

TRUNCATE TABLE S;

GO

INSERT INTO S VALUES (2, 'A');

INSERT INTO S VALUES (4, 'B');

INSERT INTO S VALUES (6, 'C');

SELECT S.C1,R.C2 FROM R JOIN S ON R.C1=S.C2 AND R.C2='A';