1. Using the following relations:

product ( pno, pname, man)

pno – product number

pname – product name

man – manufacturer identification number

manufacturer ( manno, mname, tickerno )

manno – manufacturer identification number

mname – manufacturer name

tickerno – stock market identification code

For each of the following, give the relational algebra (6 points each), tuple relational calculus (5 points each) and domain relational calculus (3 points each) notion for each.

**Answer:**

a. Find the pno of all products:

1. Relational Algebra:

Πpno(product)

2. Tuple Calculus:

{p | ∀ t ϵ product (p[pno] = t[pno])}

3. Domain Calculus:

{<p> | ∀ p, pn, ma (<p, pn, ma> ϵ product)}

b. Find all tuples in product where pname = “eraser”:

1. Relational Algebra:

Πpno,pname,man(σpname=”eraser”(product))

2. Tuple Calculus:

{t |∃ r ϵ product (t[pno] = r[pno]) Ʌ r[pname] = “eraser”}

3. Domain Calculus:

{<p, ma> | ∃ p, pn, ma (<p,pn,ma> ϵ product Ʌ pn = “eraser”)}

c. Find pno and tickerno for all products:

1. Relational Algebra:

Πpno,tickerno(σproduct.man = manufacturer.manno (product × manufacturer))

2. Tuple Calculus:

{t | ∀ p ϵ product (t[pno] = p[pno]) Ʌ (∃ m ϵ manufacturer (t[man] = m[manno]))}

3. Domain Calculus:

{<p,t> | ∀ p, pn, ma (<p, pn, ma> ϵ product) Ʌ (∃ t (<ma, mn ,t> ϵ manufacturer ))}

2. Write the SQL code for division. Try to do it without using the EXCEPT clause. If you cannot figure it out, I will accept the EXCEPT clause with a slight deduction in points. There are no particular tables for this assignment, so you make up table and entity names if necessary for your code. (8 points)

Remember you can write r ÷ s as

temp1 <-π R-S (r)

temp2 <-πR-S ((temp1 x s) – πR-S,S(r ))

result = temp1 – temp2

SELECT DISTINCT a.pno

FROM r as a

WHERE NOT EXISTS (SELECT \* FROM s as b

WHERE NOT EXISTS

(SELECT \* FROM r as c

WHERE (c.pno=a.pno) and (c.man=b.man)));