

## CPSC 408

### Assignment 01, 65 Points

**Consider a relational database with the following schema:**

Suppliers (sid, sname, address)

Parts (pid, pname, color)

Catalog (sid, pid, cost)

The relation **Suppliers** stores supplier related information. **Parts** records information about parts. **Catalog** stores which supplier supplies which part at which cost. Think of it as a linking relation between Suppliers and Parts.

**Write relational algebra expressions for the following queries.**

1. Find the names of suppliers who supply some red part.
2. Find the IDs of suppliers who supply some red or green part.
3. Find the IDs of suppliers who supply some red part or are based at 21 George Street.
4. Find the names of suppliers who supply some red part or are based at 21 George Street.
5. Find the IDs of suppliers who supply some red part and some green part.(Hint: use intersection of relations or join the same relation several times)
6. Find pairs of IDs such that the supplier with the first ID charges more for some part than the supplier with the second ID.(Hint: you may want to create temporary relations to get two copies of Catalog)
7. Find the IDs of suppliers who supply only red parts.(Hint: A supplier supplies only red parts if it is not the case that the supplier offers a part that is not red. This question is a challenge!)
8. Find the IDs of suppliers who supply every part.(Hint: A supplier supplies every part if it is not the case that there is some part which they do not supply. Use set difference and cross product. This question is a challenge, too!)

**The following queries are written in relational algebra. What do they mean?**

1.  $\pi_{\text{sname}}(\sigma_{\text{color}=\text{"red"}}(\text{Part}) \bowtie \sigma_{\text{cost}<100}(\text{Catalog}) \bowtie \text{Supplier})$
2.  $\pi_{\text{sname}}(\pi_{\text{sid}}(\sigma_{\text{color}=\text{"red"}}(\text{Part}) \bowtie \sigma_{\text{cost}<100}(\text{Catalog})) \bowtie \text{Supplier})$
3.  $\pi_{\text{sname}}(\sigma_{\text{color}=\text{"red"}}(\text{Part}) \bowtie \sigma_{\text{cost}<100}(\text{Catalog}) \bowtie \text{Supplier}) \cap$   
 $\pi_{\text{sname}}(\sigma_{\text{color}=\text{"green"}}(\text{Part}) \bowtie \sigma_{\text{cost}<100}(\text{Catalog}) \bowtie \text{Supplier})$
4.  $\pi_{\text{sid}}(\sigma_{\text{color}=\text{"red"}}(\text{Part}) \bowtie \sigma_{\text{cost}<100}(\text{Catalog}) \bowtie \text{Supplier}) \cap$   
 $\pi_{\text{sid}}(\sigma_{\text{color}=\text{"green"}}(\text{Part}) \bowtie \sigma_{\text{cost}<100}(\text{Catalog}) \bowtie \text{Supplier})$
5.  $\pi_{\text{sname}}(\pi_{\text{sid},\text{sname}}(\sigma_{\text{color}=\text{"red"}}(\text{Part}) \bowtie \sigma_{\text{cost}<100}(\text{Catalog}) \bowtie \text{Supplier}) \cap$   
 $\pi_{\text{sid},\text{sname}}(\sigma_{\text{color}=\text{"green"}}(\text{Part}) \bowtie \sigma_{\text{cost}<100}(\text{Catalog}) \bowtie \text{Supplier}))$

### **References:**

Most of these exercises are taken from the book “Database Management Systems” by Ramakrishnan/Gehrke, Chapter 4.

### **Deliverables:**

Submit your answers in a single PDF document, alongside a README inside a compressed folder with the name FirstNameInitialLastName\_AssignmentNumber.zip (e.g., SClibourne\_Assignment1.zip). The README should include your name, any special instructions for running your code, and all references used for the assignment.

You can either write out your queries in Word and then convert to PDF or take screenshots of your handwritten answers and use those in your PDF document.