Quiz 6: Declarative Queries

Consider the following schema, where the key field(s) are underlined (e.g., sid is the key for Supplier), and the domain of each field is listed after the italicized field name. The Catalog relation lists the prices charged for parts by Suppliers. Write the following queries in the indicated language (either the tuple relational calculus, denoted TRC, or SQL).

 Suppliers (sid: integer, sname: string, address: string)
 Parts (pid: integer, pname: string, color: string)
 Catalog (sid: integer, pid: integer, cost: decimal(8,2))

1) [SQL] Find the pnames of parts for which there is some supplier. (2 Pts)

   SELECT DISTINCT p.pname
   FROM Parts p, Catalog c
   WHERE p.pid = c.pid

2) [TRC] Find the snames of Suppliers who supply a yellow part that costs < 100. (2 Pts)

   \{t(sname) | \exists s \in Suppliers (t.sname = s.sname \land
   \ (\exists c \in Catalog (c.sid = s.sid \land c.cost < 100 \land
   \ (\exists p \in Parts (p.pid = c.pid \land p.color = 'yellow')))))\}

   SQL:
   SELECT DISTINCT sname
FROM Suppliers s, Catalog c, Parts p
WHERE s.sid = c.sid AND c.pid = p.pid AND p.color = 'yellow' AND c.cost < 100;

3) **[SQL]** Find the `sids` of suppliers who supply a yellow part and a blue part. (2 Pts)

```sql
SELECT c.sid
FROM Catalog c, Parts p
WHERE c.pid = p.pid AND p.color = 'yellow'
INTERSECT SELECT c1.sid
    FROM Catalog c1, Parts p1
    WHERE c1.pid = p1.pid AND p1.color = 'blue';
```

Alternative (MySQL):
```sql
SELECT sid1.sid FROM (SELECT c.sid
FROM Catalog c, Parts p
WHERE c.pid = p.pid AND p.color = 'yellow') AS sid1
JOIN (SELECT c1.sid
FROM Catalog c1, Parts p1
WHERE c1.pid = p1.pid AND p1.color = 'blue') AS sid2
ON sid1.sid = sid2.sid;
```

```sql
SELECT s.sid FROM Suppliers s
WHERE EXISTS (SELECT * FROM Catalog c1, Parts p1
WHERE c1.sid = s.sid AND c1.pid = p1.pid AND p1.color = 'yellow')
AND EXISTS (SELECT * FROM Catalog c2, Parts p2
WHERE c2.sid = s.sid AND c2.pid = p2.pid AND p2.color = 'blue');
```

```sql
{t(sid) | \( \exists s \in \text{Suppliers} \ (t.sid = s.sid \land \)
( \( \exists c1 \in \text{Catalog} \ (c1.sid = s.sid \land \ (\exists p1 \in \text{Parts} \ (p1.pid = c1.pid \land p1.color = 'yellow'))) \land
(\exists c2 \in \text{Catalog} \ (c2.sid = s.sid \land (\exists p2 \in \text{Parts} \ (p2.pid = c2.pid \land p2.color = 'blue')))}}
```

4) **[TRC]** Find the `snames` of suppliers who supply ONLY purple parts. (2 Pts)

```sql
{t(sname) | \( \exists s \in \text{Suppliers} \ (t.sname = s.sname \land
(\exists c1 \in \text{Catalog} \ (c1.sid = s.sid)) \land
(\exists c2 \in \text{Catalog} \ (\exists p \in \text{Parts} \ (s.sid = c2.sid \land c2.pid = p.pid \land p.color \neq 'purple'))))}
```
SQL:

```sql
SELECT DISTINCT S.sname
FROM Suppliers S
WHERE S.sid NOT IN (SELECT C1.sid
    FROM Parts P, Catalog C1
    WHERE C1.pid = P.pid
    AND p.color <> 'purple'
)
```

5) **SQL** Find the `sids` of suppliers who supply the most expensive red part along with the `pname` of the part. (2 Pts)

```sql
SELECT  c.sid, p.pname
FROM Catalog c, Parts p
WHERE c.pid = p.pid AND p.color = 'red' AND c.cost = (  
    SELECT MAX(c2.cost) FROM Catalog c2, Parts p2  
    WHERE p2.pid = c2.pid AND p2.color = 'red';  
);  
```