CSCB20 - Databases and Web Applications

Assignment 1 Part B: SQL Queries

Name: Sibo Dong, Dann Sioson
Student Number: 1003400269, 1001346377
Instructor: Professor Attarwala
Date: February 9, 2018

2. (40 points) Write the following queries (in **SQL only**), based on the database schema:

```
Product(maker, model, type)
PC(model, speed, ram, hd, price)
Laptop(model, speed, ram, hd, screen, price)
Printer(model, color, type, price)
```

Find the following using SQL queries, and resulting sample data from figures on Worksheet 1:

(a) "Give the manufacturer and speed of laptops with a hard disk of at least thirty gigabytes"

```
SELECT DISTINCT maker,
       speed
FROM   Product
       NATURAL JOIN (SELECT *
                     FROM   Laptop
                     WHERE  hd >= 30) As ValidHd
```

Resulting sample data:

maker	speed
A	2
A	2.16
B	1.83
E	2
E	1.73
E	1.8
F	1.6
G	2

(b) "Find the model number and price of all products (of any type) made by manufacturer B"

```
SELECT model,
       price
FROM   PC
       NATURAL JOIN (SELECT *
                     FROM   Product
                     WHERE  maker = "B") AS OnlyB
UNION
SELECT model,
       price
FROM   Laptop
       NATURAL JOIN (SELECT *
                     FROM   Product
                     WHERE  maker = "B") AS OnlyB
UNION
SELECT model,
       price
FROM   Printer
```

```
          NATURAL JOIN (SELECT *
                        FROM   Product
                        WHERE  maker = "B") AS OnlyB
```

Resulting sample data:

model	price
1004	649
1005	630
1006	1049
2007	1429

(c) “Find those manufacturers that sell Laptops, but not PC’s”

```
SELECT DISTINCT maker
FROM   Product
WHERE  type = "laptop"
       AND maker NOT IN (SELECT maker
                         FROM   Product
                         WHERE  type = "PC")
```

Resulting sample data:

maker
F
G

(d) “Find those hard-disk sizes that occur in two or more PC’s”

```
SELECT DISTINCT PC1.hd
FROM   PC AS PC1,
       PC AS PC2
WHERE  PC1.model < PC2.model
       AND PC1.hd = PC2.hd
```

Resulting sample data:

hd
250
80
160

(e) “Find those pairs of PC models that have both the same speed and RAM. A pair should be listed only once; e.g. list (i,j) but not (j,i)”

```
SELECT PC1.model,
       PC2.model
```

```
FROM   PC AS PC1,
       PC AS PC2
WHERE  PC1.model < PC2.model
       AND PC1.speed = PC2.speed
       AND PC1.ram = PC2.ram
```

Resulting sample data:

model	model
1004	1012

(f) “Find those manufacturers of at least two different computers (PC’s or laptops) with speeds of at least 3.0”

```
SELECT PCLap1.maker
FROM   (SELECT model,
               maker
        FROM   Product
               NATURAL JOIN (SELECT model
                             FROM   Laptop
                             WHERE  speed >= 3.00
                             UNION
                             SELECT model
                             FROM   PC
                             WHERE  speed >= 3.00) AS GreaterThree) AS PCLap1,
       (SELECT model,
               maker
        FROM   Product
               NATURAL JOIN (SELECT model
                             FROM   Laptop
                             WHERE  speed >= 3.00
                             UNION
                             SELECT model
                             FROM   PC
                             WHERE  speed >= 3.00) AS GreaterThree) AS PCLap2
WHERE  PCLap1.maker = PCLap2.maker
       AND PCLap1.model < PCLap2.model
```

Resulting sample data:

maker
B

(g) “Find the makers of PC’s with a speed of at least 3.0”

```
SELECT DISTINCT maker
FROM   Product
       NATURAL JOIN (SELECT model
                     FROM   PC
                     WHERE  speed >= 3.00) AS GreaterThree
```

Resulting sample data:

maker
B
E

(h) “Find the printers with the highest price”

```
SELECT model
FROM   Printer
WHERE  price = (SELECT MAX(price)
                FROM   Printer)
```

Resulting sample data:

model
3003

(i) “Find the laptops whose speed is slower than that of any PC”

```
SELECT model
FROM   Laptop
WHERE  speed < (SELECT MIN(speed)
                FROM   PC)
```

Resulting sample data (single NULL entry, left as blank):

model

(j) ”Find the model number of the item (PC, laptop or printer) with the highest price”

```
SELECT model
FROM   (SELECT model,
               price
        FROM   PC
        UNION
        SELECT model,
               price
        FROM   Laptop
        UNION
        SELECT model,
               price
        FROM   Printer) AS All3Prod
WHERE  price = (SELECT MAX(price)
                FROM   (SELECT model,
                               price
                        FROM   PC
                        UNION
                        SELECT model,
                               price
                        FROM   Laptop
                        UNION
                        SELECT model,
                               price
                        FROM   Printer) AS All3Prod)
```

Resulting sample data:

model
2001

(k) ”Find the maker of the color printer with the lowest price”

```
SELECT maker
FROM   Product
       NATURAL JOIN (SELECT model
                     FROM   Printer
                     WHERE  color = true
                            AND price = (SELECT MIN(price)
                                         FROM   Printer
                                         WHERE  color = true)) AS LeastPrice
```

Resulting sample data:

maker
E

(l) ”Find the maker(s) of the PC(s) with the fastest processor among all those PC’s that have the smallest amount of RAM”

```
SELECT maker
FROM   Product
       NATURAL JOIN (SELECT *
                     FROM   PC
                     WHERE  ram = (SELECT MIN(ram)
                                       FROM   PC)) AS MinRam
    WHERE  speed = (SELECT MAX(speed)
                    FROM   (SELECT *
                            FROM   PC
                            WHERE  ram = (SELECT MIN(ram)
                                          FROM   PC)) AS MinRam)
```

Resulting sample data:

maker
B

(m) ”Write a query that will produce information about all products (PC, laptops, and printers) including their manufacturer if available, and whatever information about that product is relevant (i.e., found in the relation for that type of product)”

```
/*A1 Part B 2m)*/
/*Can use a different join here.*/
    SELECT maker,
           PC.model,
           Product.type,
           speed,
           ram,
           hd,
           NULL AS screen,
           NULL AS color,
           NULL AS type,
           price
    FROM   PC
           INNER JOIN Product
                   ON PC.model = Product.model
    UNION
    SELECT maker,
           Laptop.model,
           Product.type,
           speed,
           ram,
           hd,
           screen,
           NULL AS color,
           NULL AS type,
           price
    FROM   Laptop
           INNER JOIN Product
                   ON Laptop.model = Product.model
    UNION
    SELECT maker,
           Printer.model,
           Product.type,
           NULL AS speed,
       NULL AS ram,
       NULL AS hd,
       NULL AS screen,
       color,
       Printer.type,
       price
FROM   Printer
       INNER JOIN Product
               ON Printer.model = Product.model
```

Resulting sample data:

maker	model	type	speed	ram	hd	screen	color	type	price
A	1001	pc	2.66	1024	250				2114
A	1002	pc	2.1	512	250				995
A	1003	pc	1.42	512	80				478
B	1004	pc	2.8	1024	250				649
B	1005	pc	3.2	512	250				630
B	1006	pc	3.2	1024	320				1049
C	1007	pc	2.2	1024	200				510
D	1008	pc	2.2	2048	250				770
D	1009	pc	2	1024	250				650
D	1010	pc	2.8	2048	300				770
E	1011	pc	1.86	2048	160				959
E	1012	pc	2.8	1024	160				649
E	1013	pc	3.06	512	80				529
E	2001	laptop	2	2048	240	20.1			3673
E	2002	laptop	1.73	1024	80	17			949
E	2003	laptop	1.8	512	60	15.4			549
A	2004	laptop	2	512	60	13.3			1150
A	2005	laptop	2.16	1024	120	17			2500
A	2006	laptop	2	2048	80	15.4			1700
B	2007	laptop	1.83	1024	120	13.3			1429
F	2008	laptop	1.6	1024	100	15.4			900
F	2009	laptop	1.6	512	80	14.1			680
G	2010	laptop	2	2048	160	15.4			2300
E	3001	printer					true	ink-jet	99
E	3002	printer					false	laser	239
E	3003	printer					true	laser	899
D	3004	printer					true	ink-jet	120
D	3005	printer					false	laser	120
H	3006	printer					true	ink-jet	100
H	3007	printer					true	laser	200

Where there exists a blank entry in this table, the entry is supposed to be a NULL value. This is purposely left blank for the ease of the reader.

3. (20 points) A general form of relational-algebra query is:

$$\pi_L(\sigma_C(R_1 \times R_2 \times \cdots \times R_n))$$

Here, L is an arbitrary list of attributes, and C is an arbitrary condition. The list of relations $R_1, R_2, \ldots, R_n$ may include the same relation repeated several times, in which case appropriate renaming may be assumed applied to the $R_i's$. Show how to express any query of this form in SQL.

```
SELECT DISTINCT L
FROM   R1,
       R2,
       ...,
       Rn
WHERE  C
```