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CSC 336 - Databases
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Project One

Part One:

A. CREATE TABLE Product(maker CHAR(40), model CHAR(40), type CHAR(40));

B. CREATE TABLE PC(model CHAR(40), speed DECIMAL (4,2), ram INTEGER, hd INTEGER, price DECIMAL(7,2));

C. CREATE TABLE Laptop(model CHAR(40), speed DECIMAL (4,2), ram INTEGER, hd INTEGER, screen DECIMAL (3,1), price DECIMAL (7,2));

D. CREATE TABLE Printer(model CHAR(40), color BOOLEAN, type CHAR(40), price DECIMAL (7,2));

E. ALTER TABLE Printer DROP color;

F. ALTER TABLE Laptop ADD od CHAR(6) DEFAULT 'none';

```
MySQL [d119]> CREATE TABLE Product(maker CHAR(40), model CHAR(40), type CHAR(40));
Query OK, 0 rows affected (0.07 sec)

MySQL [d119]> SHOW TABLES;
+----------------+
| Tables_in_d119 |
+----------------+
| Product        |
+----------------+
1 row in set (0.00 sec)

MySQL [d119]> CREATE TABLE PC(model CHAR(40), speed DECIMAL (4,2), ram INTEGER, hd INTEGER, price DECIMAL(7,2));
Query OK, 0 rows affected (0.05 sec)

MySQL [d119]> SHOW TABLES;
+----------------+
| Tables_in_d119 |
+----------------+
| PC             |
| Product        |
+----------------+
2 rows in set (0.00 sec)

MySQL [d119]> CREATE TABLE Laptop(model CHAR(40), speed DECIMAL (4,2), ram INTEGER, hd INTEGER, screen DECIMAL (3,1), price DECIMAL (7,2));
Query OK, 0 rows affected (0.05 sec)

MySQL [d119]> SHOW TABLES;
+----------------+
| Tables_in_d119 |
+----------------+
| Laptop         |
| PC             |
| Product        |
+----------------+
3 rows in set (0.00 sec)

MySQL [d119]> CREATE TABLE Printer(model CHAR(40), color BOOLEAN, type CHAR(40), price DECIMAL (7,2));
Query OK, 0 rows affected (0.06 sec)

MySQL [d119]> SHOW TABLES;
+----------------+
| Tables_in_d119 |
+----------------+
| Laptop         |
| PC             |
| Printer        |
| Product        |
+----------------+
4 rows in set (0.00 sec)

MySQL [d119]> ALTER TABLE Printer DROP color;
Query OK, 0 rows affected (0.07 sec)
Records: 0  Duplicates: 0  Warnings: 0

MySQL [d119]> ALTER TABLE Laptop ADD od CHAR(6) DEFAULT 'none';
Query OK, 0 rows affected (0.10 sec)
Records: 0  Duplicates: 0  Warnings: 0
```

Schema for relation PC:

```
MySQL [d119]> DESCRIBE PC;
+-------+--------------+------+-----+---------+-------+
| Field | Type         | Null | Key | Default | Extra |
+-------+--------------+------+-----+---------+-------+
| model | char(40)     | YES  |     | NULL    |       |
| speed | decimal(4,2) | YES  |     | NULL    |       |
| ram   | int(11)      | YES  |     | NULL    |       |
| hd    | int(11)      | YES  |     | NULL    |       |
| price | decimal(7,2) | YES  |     | NULL    |       |
+-------+--------------+------+-----+---------+-------+
5 rows in set (0.01 sec)
```

Schema for relation Product:

```
MySQL [d119]> DESCRIBE Product;
+-------+----------+------+-----+---------+-------+
| Field | Type     | Null | Key | Default | Extra |
+-------+----------+------+-----+---------+-------+
| maker | char(40) | YES  |     | NULL    |       |
| model | char(40) | YES  |     | NULL    |       |
| type  | char(40) | YES  |     | NULL    |       |
+-------+----------+------+-----+---------+-------+
3 rows in set (0.01 sec)
```

Schema for relation Laptop:

```
MySQL [d119]> DESCRIBE Laptop;
+--------+--------------+------+-----+---------+-------+
| Field  | Type         | Null | Key | Default | Extra |
+--------+--------------+------+-----+---------+-------+
| model  | char(40)     | YES  |     | NULL    |       |
| speed  | decimal(4,2) | YES  |     | NULL    |       |
| ram    | int(11)      | YES  |     | NULL    |       |
| hd     | int(11)      | YES  |     | NULL    |       |
| screen | decimal(3,1) | YES  |     | NULL    |       |
| price  | decimal(7,2) | YES  |     | NULL    |       |
| od     | char(6)      | YES  |     | none    |       |
+--------+--------------+------+-----+---------+-------+
7 rows in set (0.00 sec)
```

Schema for relation Printer:

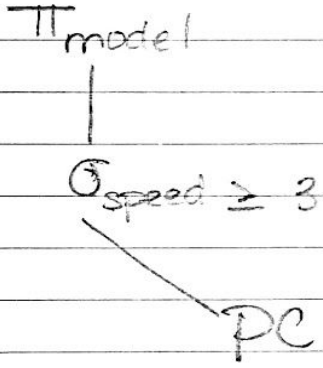
```
MySQL [d119]> DESCRIBE Printer;
+-------+--------------+------+-----+---------+-------+
| Field | Type         | Null | Key | Default | Extra |
+-------+--------------+------+-----+---------+-------+
| model | char(40)     | YES  |     | NULL    |       |
| type  | char(40)     | YES  |     | NULL    |       |
| price | decimal(7,2) | YES  |     | NULL    |       |
+-------+--------------+------+-----+---------+-------+
3 rows in set (0.00 sec)
```

Part 2 : Relational Algebra Expressions

a) What PC models have a speed of at least 3.00?
↳ ≥ 3.00

$R1 = \sigma_{speed \geq 3.00}(PC)$ ← condition

$R2 = \Pi_{model}(R1)$ ← projection



b) Which manufactures (maker) make laptop with a hard disk (hd) of at least 100 GB?
>= 100

$R1 = \sigma_{hd \geq 100}(laptop)$ ← condition

$R2 = Product \bowtie (R1)$ ← Displays common data of the tables Product & Laptop

$R3 = \Pi_{maker}(R2)$ ← Displays the result of maker aka manufactures

c) Find the model number and price of all products (of any type) made by manufacture B.

$R1 = \sigma_{maker=B}(PRODUCT \bowtie PC)$

↳ displays data common maker B of tables product & PC

$R2 = \sigma_{maker=B}(PRODUCT \bowtie LAPTOP)$

↳ this displays data common maker B of tables product & laptop

$R3 = \sigma_{maker=B}(PRODUCT \bowtie PRINTER)$

↳ displays common data maker B of these 2 tables, product & printer.

$R4 = \Pi_{model, price}(R1)$

↳ R4 displays the model & price of PC obtained from R1

$R5 = \Pi_{model, price}(R2)$

↳ R5 displays the model & price obtained from R2

$R6 = \Pi_{model, price}(R3)$

↳ R6 displays the model & price obtained from R3.

$R7 = R4 \cup R5 \cup R6$

d) Find the model number of all color laser printer.

boolean ↑ ↑ type

$R1 = \sigma_{color = true \text{ AND } type = laser}(PRINTER)$ ← condition

$R2 = \Pi_{model}(R1)$ ← projection

e) Find those manufactures that sell Laptops, but not PCs.

$R1 = \sigma_{type = laptop}(PRODUCT)$

$R2 = \sigma_{type = PC}(PRODUCT)$

> display product of type laptop in R1 & type PC in R2

$R3 = \Pi_{maker}(R1)$

$R4 = \Pi_{maker}(R2)$

> displays maker of Product table obtained from R1. and here we display Product table obtained from R2

$R5 = R3 - R4$

↑ Result displays the common data obtained from R3 and R4

Part Three:

Uploaded Data to each table:

```
MySQL [d119]> SELECT * FROM Product;
+--------+-------+----------+
| maker  | model | type     |
+--------+-------+----------+
| A      | 1001  | pc       |
| A      | 1002  | pc       |
| A      | 1003  | pc       |
| A      | 2004  | laptop   |
| B      | 1005  | pc       |
| A      | 2005  | laptop   |
| A      | 2006  | laptop   |
| B      | 1004  | pc       |
| B      | 1006  | pc       |
| B      | 2007  | laptop   |
| C      | 1007  | pc       |
| D      | 1008  | pc       |
| D      | 1009  | pc       |
| D      | 1010  | pc       |
| D      | 3004  | printer  |
| D      | 3005  | printer  |
| E      | 1011  | pc       |
| E      | 1012  | pc       |
| E      | 1013  | pc       |
| E      | 2001  | laptop   |
| E      | 2002  | laptop   |
| E      | 2003  | laptop   |
| E      | 3001  | printer  |
| E      | 3002  | printer  |
| E      | 3003  | printer  |
| F      | 2008  | laptop   |
| F      | 2009  | laptop   |
| G      | 2010  | laptop   |
| H      | 3006  | printer  |
| H      | 3007  | printer  |
+--------+-------+----------+
30 rows in set (0.00 sec)
```

```
MySQL [d119]> SELECT * FROM PC;
+-------+-------+------+------+---------+
| model | speed | ram  | hd   | price   |
+-------+-------+------+------+---------+
| 1001  |  2.66 | 1024 |  250 | 2114.00 |
| 1002  |  2.10 |  512 |  250 |  995.00 |
| 1003  |  1.42 |  512 |   80 |  478.00 |
| 1004  |  2.80 | 1024 |  250 |  649.00 |
| 1005  |  3.20 |  512 |  250 |  630.00 |
| 1006  |  3.20 | 1024 |  320 | 1049.00 |
| 1007  |  2.20 | 1024 |  200 |  510.00 |
| 1008  |  2.20 | 2048 |  250 |  770.00 |
| 1009  |  2.00 | 1024 |  250 |  650.00 |
| 1010  |  2.80 | 2048 |  300 |  770.00 |
| 1011  |  1.86 | 2048 |  160 |  959.00 |
| 1012  |  2.80 | 1024 |  160 |  649.00 |
| 1013  |  3.06 |  512 |   80 |  529.00 |
+-------+-------+------+------+---------+
13 rows in set (0.01 sec)
```

```
MySQL [d119]> SELECT * FROM PRINTER;
+-------+-------+---------+--------+
| model | color | type    | price  |
+-------+-------+---------+--------+
| 3004  | true  | ink-jet |  99.00 |
| 3005  | false | laser   | 239.00 |
| 3001  | true  | laser   | 899.00 |
| 3002  | true  | ink-jet | 120.00 |
| 3003  | false | laser   | 120.00 |
| 3006  | true  | ink-jet | 100.00 |
| 3007  | true  | laser   | 200.00 |
+-------+-------+---------+--------+
7 rows in set (0.00 sec)
```

```
MySQL [d119]> SELECT * FROM Laptop;
+-------+-------+------+------+--------+-------+------+
| model | speed | ram  | hd   | screen | price | od   |
+-------+-------+------+------+--------+-------+------+
| 2004  |  2.00 | 2048 |  240 |   20.1 |  0.00 | 3673 |
| 2005  |  1.73 | 1024 |   80 |   17.0 |  0.00 | 949  |
| 2006  |  1.80 |  512 |   60 |   15.4 |  0.00 | 549  |
| 2007  |  2.00 |  512 |   60 |   13.3 |  0.00 | 1150 |
| 2001  |  1.16 | 1024 |  120 |   13.0 |  0.00 | 2500 |
| 2002  |  2.00 | 2048 |   80 |   15.4 |  0.00 | 1700 |
| 2003  |  1.83 | 1024 |  120 |   13.3 |  0.00 | 1429 |
| 2008  |  1.60 | 1024 |  100 |   15.4 |  0.00 | 900  |
| 2009  |  1.60 |  512 |   80 |   14.1 |  0.00 | 680  |
| 2010  |  2.00 | 2048 |  160 |   15.4 |  0.00 | 2300 |
+-------+-------+------+------+--------+-------+------+
10 rows in set (0.00 sec)
```

NOTE: I had to create a new printer table since for part 1e, I deleted color, also changed the color from boolean to CHAR(6) since boolean was causing some trouble when gathering the table to calculate part 3c.

a) SELECT model FROM PC WHERE speed >= 3.00;

```
MySQL [d119]> SELECT model
    -> FROM PC
    -> WHERE speed >= 3.00;
+-------+
| model |
+-------+
| 1005  |
| 1006  |
| 1013  |
+-------+
3 rows in set (0.00 sec)
```

b) SELECT maker FROM Laptop NATURAL JOIN WHERE hd >= 100;

```
MySQL [d119]> SELECT maker
    -> FROM Laptop
    -> NATURAL JOIN Product
    -> WHERE hd >= 100;
+-------+
| maker |
+-------+
| A     |
| E     |
| E     |
| F     |
| G     |
+-------+
5 rows in set (0.00 sec)
```

c) SELECT model FROM PRINTER WHERE color = ‘true’ AND type = ‘laser’;

```
MySQL [d119]> SELECT model
    -> FROM PRINTER
    -> WHERE color = 'true' AND type = 'laser';
+-------+
| model |
+-------+
| 3001  |
| 3007  |
+-------+
2 rows in set (0.00 sec)
```