ICCS240: Assignment 1

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Problem 1:

1. mn
2. m^n

Problem 2:

(1) $\Pi_B(R \bowtie S) = \Pi_B(R) \cap \Pi_B(S)$
For the left side, from the definition of natural join,
$\Pi_B(R \bowtie S) = \Pi_{R \cup B}(\sigma_{R.B=S.B}(R \times B)) = \{B | B \in R \cap B \in S\}$

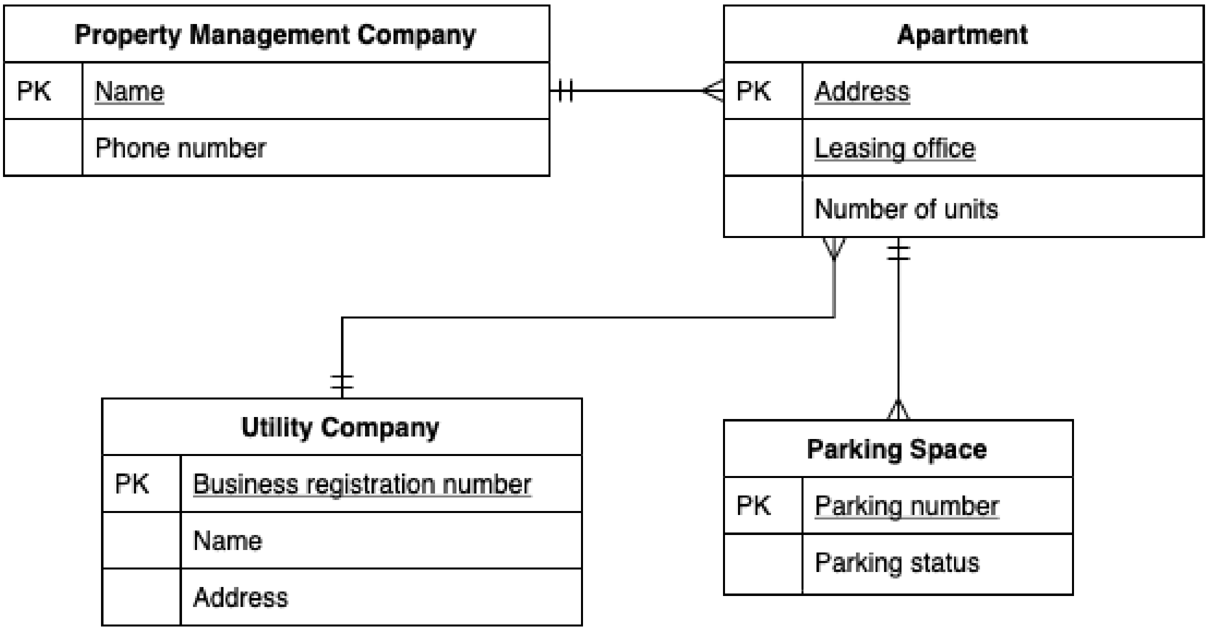
For the right side, $\Pi_B(R) \cap \Pi_B(S) = \{B | B \in R \cap B \in S\}$
which is equal to the right side.

Hence, both sides are equivalent.

(2) $\Pi_{A,C}(R \bowtie \sigma_{B=0}(S)) = \Pi_A(\sigma_{B=0}(R)) \times \Pi_C(\sigma_{B=0}(S))$

Problem 3:

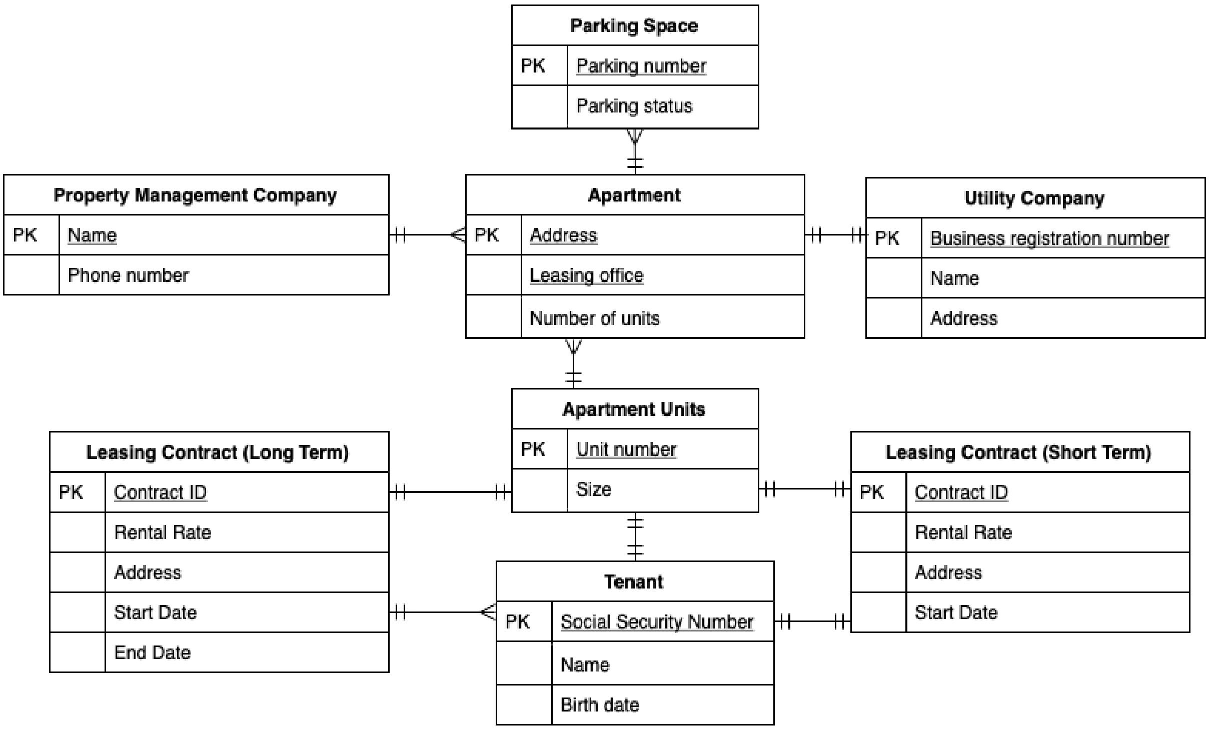
(1)



(2)

propcompany(propname: *string*, propno: *int*)
apartment(aptaddress: *string*, office: *string*, units: *int*)
parking(parkno: *int*, status: *string*)
utilcompany(utilno: *int*, utilname: *string*, utiladdress: *string*)

Problem 4:



Problem 5:

```
beer(brand, standard_price, alcohol_percentage, country_brewed, country_sold)
company(brand, HQ_location, year_founded)
bar(name, location, brand_of_beer_sold, price_sold)
sale(bar, brand_of_beer, year_record, number_of_sold)
```

(1)

beer:
PRIMARY KEY (brand)

company:
PRIMARY KEY (HQ_location)
FOREIGN KEY (brand) REFERENCES beer (brand)

bar:
PRIMARY KEY (name)
FOREIGN KEY (brand_of_beer_sold) REFERENCES beer (brand)

sale:
PRIMARY KEY (year_record)
FOREIGN KEY (bar) REFERENCES bar (name)

FOREIGN KEY (brand_of_beer) REFERENCES beer (brand)

(2a)

```
SELECT name FROM beer WHERE country_brewed <> country_sold
```

$\Pi_{name}\sigma_{country\_brewed != country\_sold}(beer)$

(2b)

```
SELECT SUM(number_of_sold) FROM sale GROUP BY year_record
```

$\Pi_{SUM(number\_of\_sold)}\sigma\gamma_{year\_record}(sale)$

(2c)

```
SELECT name, brand FROM bar, beer WHERE price_sold > standard_price
```

$\Pi_{name,brand}\sigma_{price\_sold > standard\_price}(bar \times beer)$

Problem 6:

```
computer (maker, model, type, price)
pc (model, speed, ram, storage)
laptop (model, speed, ram, storage, screen)
```

(1)

```
SELECT DISTINCT COUNT(maker) FROM computer GROUP BY type
```

(2)

```
SELECT maker FROM computer ORDER BY (
SELECT COUNT(model) FROM computer GROUP BY maker)
DESC WHERE rownum = 1
```

(3)

```
SELECT ABS(compc.price - comlaptop.price) difference
FROM computer compc
INNER JOIN computer comlaptop ON
    compc.maker = comlaptop.maker
INNER JOIN pc ON
     pc.model = compc.model
INNER JOIN laptop ON
     laptop.model = comlaptop.model
WHERE ABS(compc.price - comlaptop.price) < 100
```