

ICCS240: Assignment 1

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Problem 1:

1. 2^{mn}
2. mn

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,

$$\Pi_B(R \bowtie S) = \Pi_{R \cup S}(\sigma_{R.B=S.B}(R \times S)) = \{B | B \in R \cap S\}$$

For the right side,

$$\Pi_B(R) \cap \Pi_B(S) = \{B | B \in R \cap S\}$$

which is equal to the right side.

Hence, both sides are equivalent. \square

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

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

$$\Pi_{A,C}\Pi_{A \cup C}(\sigma_{B=0}(R \times S)) = \Pi_{A,C}(\sigma_{B=0}(R)) \times \sigma_{B=0}(S)$$

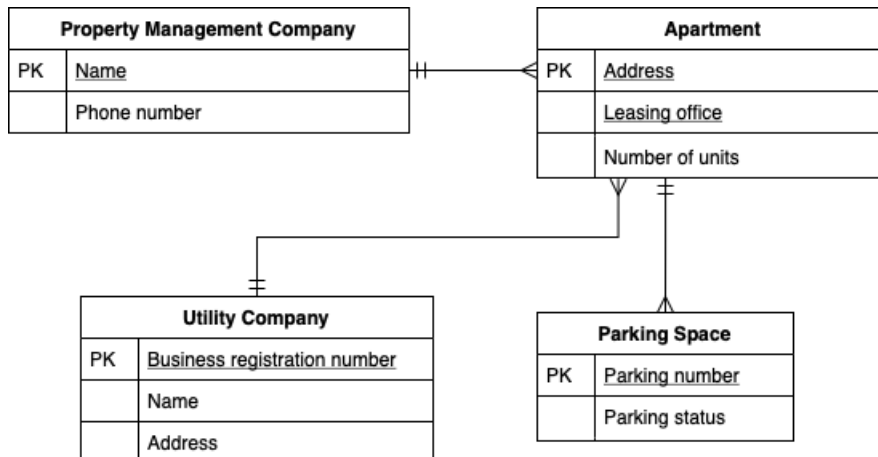
$$\sigma_{B=0}(R \times S) = \sigma_{B=0}(R) \times \sigma_{B=0}(S)$$

$$\sigma_{B=0}(R \times S) = \sigma_{B=0}(R \times S)$$

Hence, both sides are equivalent. \square

Problem 3:

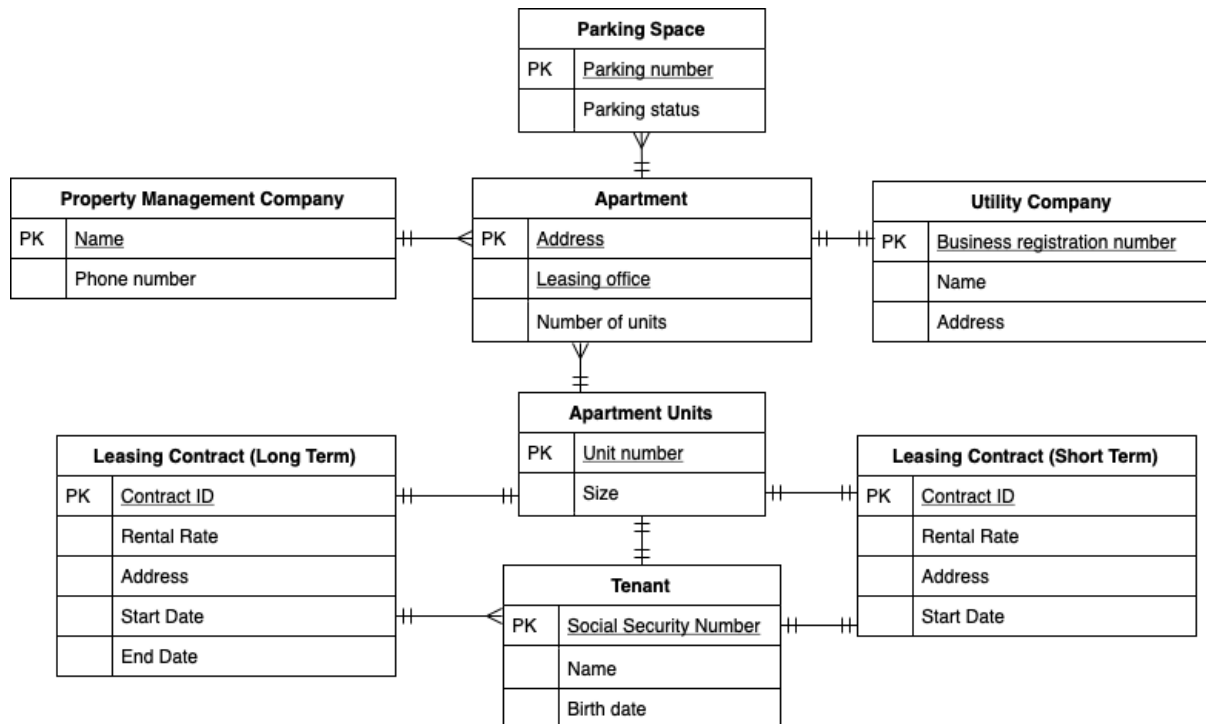
1



(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: NONE

FOREIGN KEY (bar) REFERENCES bar (name)

FOREIGN KEY (brand_of_beer) REFERENCES beer (brand)

(2a)

SELECT name FROM beer WHERE country_brewed <> country_sold

$\Pi_{name} \sigma_{country_brewed \neq country_sold}(beer)$

(2b)

SELECT SUM(number_of_sold) FROM sale GROUP BY year_record

$\Pi_{SUM(number_of_sold)} \sigma_{year_record}(sale)$

(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 compc.model, comlaptop.model, ABS(compc.price - comlaptop.price) difference
FROM computer compc
INNER JOIN computer comlaptop ON
 compc.maker = comlaptop.maker
WHERE compc.type = "pc"
AND comlaptop.type = "laptop"
AND ABS(compc.price - comlaptop.price) < 100