日期: /

五班 贾星宇 2020003001125

一、 习题 2.12

employee (person-name, street, city)

works (person-name, company-name, salary)

company (company-name, city)

解: a. $\Pi_{\text{person-name}}(\sigma_{\text{company-name}=\text{'First Bank Corporation'}}(\text{works}))$

b. $\Pi_{\text{person-name, city}}(\sigma_{\text{company-name}=\text{'First Bank Corporation'}}(\text{works}) \bowtie \text{employee})$

c. $\Pi_{\text{person-name, street, city}}(\sigma_{\text{company-name}=\text{'First Bank Corporation'} \wedge \text{salary} > 10000}(\text{works}) \bowtie \text{employee})$

二、

1. $\Pi_{a.\text{person\_name}, a.\text{street}, a.\text{city}}(\sigma_{a.\text{person\_name}=c.\text{person\_name} \wedge b.\text{person\_name}=c.\text{manager\_name} \wedge a.\text{street}=b.\text{street} \wedge a.\text{city}=b.\text{city}}(\rho_a(\text{Employee}) \times \rho_b(\text{Employee}) \times \rho_c(\text{Manages})))$

2. $\Pi_{\text{person\_name}}(\text{Works}) - \Pi_{\text{person\_name}}(\sigma_{\text{company\_name}=\text{'First Bank Corporation'}}(\text{Works}))$

3. $\Pi_{\text{person\_name}}(\sigma_{\text{salary}>\max(\text{salary})}(\mathcal{G}_{\max(\text{salary})}(\sigma_{\text{company\_name}=\text{'xxx'}}(\text{Works})) \times \text{Works}))$

4. $\text{Employee} \bowtie \Pi_{\text{person\_name}}(\sigma_{\text{manager-name}=\text{'Jones'}}(\text{Manages}))$

5. $\Pi_{\text{city}}(\text{Employee} \bowtie \Pi_{\text{person\_name}}(\sigma_{\text{manager-name}=\text{'Jones'}}(\text{Manages})))$

6. $\text{Employee} \bowtie \Pi_{a.\text{manager\_name}}(\sigma_{a.\text{person\_name}=b.\text{manager\_name}}(\rho_a(\text{Managers}) \times \rho_b(\sigma_{\text{person-name}=\text{'Jones'}}(\text{Manages}))))$

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7. Employee ⋈ $\Pi_{person\_name}(\sigma_{salary > max(salary)}(Works \times G_{max(salary)}(\sigma_{city='Mumbai'}(Employee) \bowtie Works)))$

8. $\Pi_{person\_name}(\sigma_{company\_name='First\ Bank\ Corporation'}(Works))$

9. $\Pi_{city}(Employee \bowtie \Pi_{person\_name}(\sigma_{company\_name='First\ Bank\ Corporation'}(Works)))$

10. $Employee \bowtie \Pi_{person\_name}(\sigma_{company\_name='First\ Bank\ Company' \wedge salary=10000}(Works))$

11. $\Pi_{a.person\_name}(\sigma_{a.company\_name = b.company\_name \wedge a.city = b.city}(\rho_a(Employee \times Works) \times \rho_b(Company)))$

12. $\Pi_{company\_name}(\sigma_{max(count(person\_name)) = count(person\_name)}(G_{max(count(person\_name))}(company\_name\ G_{count(person\_name)}(Works)))) \times (company\_name\ G_{count(person\_name)}(Works))) \bowtie Company$

13. $Company \bowtie \Pi_{company\_name}(\sigma_{min(sum(Salary)) = sum(salary)}(G_{min(sum(Salary))}(company\_name\ G_{sum(Salary)}(Works)) \times company\_name\ G_{sum(Salary)}(Works)))$

14. $\Pi_{b.company\_name}(\sigma_{b.avg(salary) > a.avg(salary)}(\rho_a(G_{avg(salary)}(\sigma_{company\_name='First\ Bank\ Company'}(Works))) \times \rho_b(company\_name\ G_{avg(salary)}(Works)))) \bowtie Company$

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三.

1. $\Pi_{name}(\sigma_{publisher='MG'}(Member \bowtie Borrowed \bowtie Books))$

2. $\Pi_{name}(Member \bowtie (\Pi_{memb\_no, isbn}(Borrowed) \div \Pi_{isbn}(\sigma_{publisher='MG'}(Books))))$

3. $\Pi_{name}(Member \bowtie (\Pi_{memb\_no}(\sigma_{count(isbn)>=5}(memb\_no\, \mathcal{G}_{count(isbn)}(\sigma_{publisher='MG'}(Books \bowtie Borrowed))))))$

4. $\Pi_{name}(Member \bowtie (\Pi_{memb\_no}(\sigma_{count(isbn)>=5}(memb\_no, publisher\, \mathcal{G}_{count(isbn)}(Books \bowtie Borrowed)))))$

5. $\mathcal{G}_{avg(count(isbn))}(memb\_no\, \mathcal{G}_{count(isbn)}(Borrowed))$