第六章作业答案

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Current Section

10. Write the following queries in relational algebra, using the university schema.

classroom(*building*, *room_number*, *capacity*)
department(*dept_name*, *building*, *budget*)
course(*course_id*, *title*, *dept_name*, *credits*)
instructor(*ID*, *name*, *dept_name*, *salary*)
section(*course_id*, *sec_id*, *semester*, *year*, *building*, *room_number*, *time_slot_id*)
teaches(*ID*, *course_id*, *sec_id*, *semester*, *year*)
student(*ID*, *name*, *dept_name*, *tot_cred*)
takes(*ID*, *course_id*, *sec_id*, *semester*, *year*, *grade*)
advisor(*s_ID*, *i_ID*)
time_slot(*time_slot_id*, *day*, *start_time*, *end_time*)
prereq(*course_id*, *prereq_id*)

a. Find the names of all students who have taken at least one Comp. Sci. course.

第一步：筛选出Comp.Sci的课程

$\sigma_{dept-name='Comp.Sci'}(course)$

第二步：通过自然连接获取Comp.Sci的课程的选课信息

$\sigma_{dept-name='Comp.Sci'}(course) \bowtie takes$

第三步：与student表自然连接以获取选课学生的姓名

$\Pi_{name}(\sigma_{dept-name='Comp.Sci'}(course) \bowtie takes \bowtie student)$.

b. Find the IDs and names of all students who have not taken any course offering before Spring 2009.

第一步：筛选出2009春之前选课信息

$\sigma_{year<2009}(takes)$

第二步：找出选了第一步的课的学生

$\Pi_{ID,name}(\sigma_{year<2009}(takes) \bowtie student)$

第三步：全部学生减去第二步的结果

$\Pi_{ID,name}(student) - \Pi_{ID,name}(\sigma_{year<2009}(takes) \bowtie student)$

具有相同列数和属性的两个表才能相减

c. For each department, find the maximum salary of instructors in that department. You may assume that every department has at least one instructor.

answer: $_{dept-name}\mathcal{G}_{max(salary)}(instructor)$

d. Find the lowest, across all departments, of the per-department maximum salary computed by the preceding query.

answer:$\mathcal{G}_{min(max-salary)}(_{dept-name}\mathcal{G}_{max(salary)as\ max-salary}(instructor)$

Current Section

14. Consider the following relational schema for a library:

member(memb-no, name, dob)

books(isbn, title, authors, publisher)

borrowed(memb-no, isbn, date)

Write the following queries in relational algebra.

a. Find the names of members who have borrowed any book published by “McGraw-Hill”.

第一步：筛选出出版者为McGraw-Hill的书

$$\sigma_{publisher='McGraw-Hill'}(books)$$

第二步：找出借了第一步的书的借书记录

$$\sigma_{publisher='McGraw-Hill'}(books) \bowtie borrowed$$

第三步：找到这些人的姓名

$$\Pi_{name}(\sigma_{publisher='McGraw-Hill'}(books) \bowtie borrowed \bowtie member)$$

b. Find the name of members who have borrowed all books published by “McGraw-Hill”.

1.找出出版者为McGraw-Hill的书的数量

$t1 \leftarrow \mathcal{G}_{count-distinct(isbn)as\ bn}(\sigma_{publisher='McGraw-Hill'}(books))$

2.找出每个人借了多少本出版者为McGraw-Hill的书

$t2 \leftarrow_{memb-no} \mathcal{G}_{count-distinct(isbn)as\ bn}(borrowed \bowtie \sigma_{publisher='McGraw-Hill'}(books))$

3.找出借了所有McGraw-Hill的书的人

$\Pi_{name}(t1 \bowtie t2 \bowtie member)$.

c. Find the name and membership number of members who have borrowed more than five different books published by “McGraw-Hill”.

第一步：找出每个人借了多少本出版者为McGraw-Hill的书

$$_{memb-no}\mathcal{G}_{count(isbn)}(borrowed \bowtie \sigma_{publisher='McGraw-Hill'}(books))$$

第二步：找出第一步结果中借了超过5本的人

$$\sigma_{bn>5}(_{memb-no}\mathcal{G}_{count-distinct(isbn)as\ bn}(borrowed \bowtie \sigma_{publisher='McGraw-Hill'}(books)))$$

第三步：找出这些人的名字

$$\Pi_{name,memb-no}(\sigma_{bn>5}(_{memb-no}\mathcal{G}_{count(isbn)as\ bn}(borrowed \bowtie \sigma_{publisher='McGraw-Hill'}(books))) \bowtie member)$$

d. For each publisher, find the name and membership number of members who have borrowed more than five books of that publisher.

1.对于每一个出版者，找出每一个成员借了他的多少书

$t1 \leftarrow_{publisher,memb-no} \mathcal{G}_{count-distinct(isbn)as\ bn}(member \bowtie borrowed \bowtie books)$

2.然后筛选出借了5本以上的成员

$\Pi_{name,memb-no}(\sigma_{bn>5}(t1))$

e. Find the average number of books borrowed per member. Take into account that if an member does not borrow any books, then that member does not appear in the borrowed relation at all.

1.找出借的所有书的数量

$t1 \leftarrow \mathcal{G}_{count(isbn)asbooknum}(borrowed)$

2.找出一共有多少个成员

$t2 \leftarrow \mathcal{G}_{count(memb-no)asmembernum}(member)$

3.计算平均值

$\Pi_{booknum/membernum}(t1 \times t2)$