

Database System Principles

Test One

Class _____ No _____ Name _____

1. (2 x 3 points) Given a table Employees and some SQL queries on it, why are these queries wrong?

Employees(employee-id, employee-name, *company-id*, employee-city, age, salary)

It is assumed that each employee has an unique id and name.

- (1) create table *Employees*
 (*employee-id* char(20),
 employee-name char(20),
 company-id char(20),
 employee-city char(20),
 age integer,
 salary integer,
 primary key (*employee-id*), primary key (*employee-name*),
 check (age > 0)
)

- (2) select employeeid, sum(salary)
 from *Employees*
 group by *company-id*
 having avg(*salary*) > 1000

(1) $\sigma_p(\mathbf{r})$

(2) $\prod_{A1,A2,...,Am} (\mathbf{r})$

(3) $r^\infty s,$
假设 $r(A,B,C), s(C,E,F)$

3. (6 points) 给出下列 SQL 语句对应的关系代数表达式

- (1)

```
select  branch-name, max (salary)  
from    pt-works  
group by branch-name
```

假设 *pt-works*(*employee-name*, *branch-name*, *salary*)
- (2)

```
insert into  r  
select       $A_1, A_2, \dots, A_m$   
from         $r_1, r_2, \dots, r_n$   
where       P
```
- (3)

```
update loan  
set amount = amount * 1.2  
where amount > 1000
```

Answers:

4. (10 points) Given two tables *branch* (*branch-name*, *branch-city*, *assets*) and *Account*(*account-number*, *branch-name*, *balance*) as follows,

- dbo. branch 摘要 对象资源		
branch-name	branch-city	assets
Brighton	Brooklyn	7100000
Downtown	Brooklyn	9000000
Mianus	Horseneck	400000
North Town	Rye	3700000
Perryridge	Horseneck	1700000
Pownal	Bennington	300000
Redwood	Palo Alto	2100000
Round Hill	Horseneck	8000000
NULL	NULL	NULL

- dbo. account 摘要 对象资源		
account-number	branch-name	balance
A-101	Downtown	500
A-102	Perryridge	400
A-201	Brighton	900
A-215	Mianus	700
A-217	Brighton	750
A-222	Redwood	700
A-305	Round Hill	350
NULL	NULL	NULL

- (1) If the table *account* is defined as :

```

create table account
(account_number char(10),
branch_name char(15),
balance integer,
primary key (account_number),
foreign key (branch_name) references branch )
  
```

whether or not the following SQL statements are permitted to be executed, and why?

- (i) Update *account*
set *branch-name*='Haidian'
where *account-number*='A-101'
- (ii) delete
from *branch*
where *branch-name*='Pownal'

Answers:

(2) If the table *account* is defined as :

```
create table account
(account_number char(10),
branch_name char(15),
balance integer,
primary key (account_number),
foreign key (branch_name) references branch
on delete cascade
on update cascade
)
```

whether or not the following SQL statements are permitted to be executed, and why?

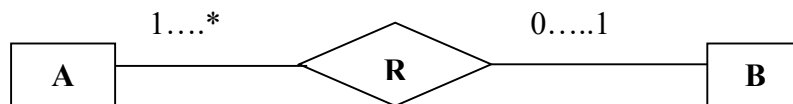
- (iii) Update *branch*
set *branch-name*='Haidian'
where *branch-name*='Brighton'
- (iv) Update *account*
set *branch-name*='Haidian'
where *account-number*='A-101'

Answers:

5. (4 points) For the entity sets **A** and **B** and the relationship set **R** among them in the following figure,

(1) point out the participation constraints of **A** and **B** in **R**

(2) what is the mapping cardinality from *A* to *B*



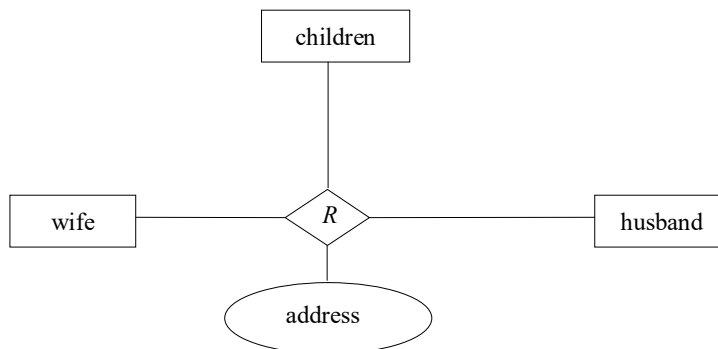
Answers:

6. (6 points) Reduce entity set *customer* into two relational tables:

<u><i>c-id</i></u>	<i>c-name</i>	<i>d-names</i>	<i>street</i>	<i>city</i>
321-12-2	John	{Hayes, Adams}	North	Rye
322-10-4	Smith	{Mary, Elice}	Spring	Princeton

Answers:

7. (6 points) Convert the following E-R diagram into a diagram that contains only binary relationships, and give the definitions of the entities and relationships in this diagram



Answers:

8. (20 points) Consider the following relations in an enterprise database, where the primary keys are underlined.

Employee(employeeID, employeename, age, address, sex, salary, deptID)

Department(deptID, deptname, managerID, managername)

DeptLocations(deptID, deptlocation)

Project(projectID, projectname, projectlocation, deptID)

Workson(employeeID, projectID, hours)

Dependent(employeeID, dependentname, sex, Birthdate, Relationship)

- 1) (5 points) Use a SQL statement to define the relational table *Employee*, in which {*employeeID*} is the primary key, and {*employee-name*} is the candidate key and is not permitted to be null; there also exists the referential integrity between the table *Employee* and *Department*. It is also required that the value of an employee's salary is between 2000 and 10000.

Answer:

```

create table employee
( employeeID integer,

```

```

employee_name varchar(50), /*也可以采用其它长度的 varchar、char 类型
age          int,
address      varchar(50),
sex          varchar(50)
salary      int; /*其它数值类型也可以
primary key (employeeID),
unique (employee_name), not null,
foreign key (deptID) references Department,
check (salary between 2000 and 10000)
)
4 个完整性约束，每个 1 分。

```


- 2) (5 points) For each department which has at least 10 employees, list its *deptID*, and calculate the total number of the employees who work in this department and whose salaries are more than 4000. Give one or more SQL statements to list the query result in **descending order** of the attribute *deptID*.

（检索出至少有 10 名员工的部门的部门号，并统计出这些部门中收入超过\$4000 的员工数目，并以部门号降序的顺序列出查询结果（部门号，统计出的员工数目））

Answer:

- 3) (5 points) Use a SQL statement to add a new attribute *city* into the table *DepartLocations*. It is assumed that the data type of *city* is *varchar(50)*.

Answer:

- 4) (5 points) A new project is started, and its information is as follows: *projectID*=1021, *projectname*='Building', *projectlocation*='Shanghai', *deptID*='201'. Find out from the department '201' all employees who currently do not work for any projects, and assign  them to this new project '1021'. It is assumed that these selected employees will work for the new project for 500 hours.

Give SQL statements to modify the tables in the database, so as to record all the information about the new project '1021' and the employees working on this project.

Answer:

9. (10 points) Given $R(A, B, C, D, E, F, G, H)$, and $F = \{A \rightarrow F, B \rightarrow E, BE \rightarrow F, E \rightarrow C, A \rightarrow G, G \rightarrow CD\}$ holding on R , find out all candidate keys of R
(利用求候选键算法，给出计算过程)

Answers:

10. (8 points) Given a schema $R(A, B, C)$ and $F = \{A \rightarrow B, B \rightarrow C\}$ holds on **Student**, and the decomposition $\{R_1(A, B); R_2(A, C)\}$ on R ,
is this decomposition lossy or lossless? Why?
is this decomposition dependency preserving? Why? .

Answers:

11. (6 points) For the following schema R and F holding on it, list all the candidate keys, give the highest normal form it belongs to, and explain why
 $R(A, B, C, D, E), F = \{A \rightarrow BC, CD \rightarrow E, B \rightarrow D, E \rightarrow A\}$

Answers:

- 12. (12 points)** Considering the schema $R=(\text{athlete-id, game-event, grade, category of games, manger of games})$ that describes the sports meeting. It is assumed that
- for each athlete, if he takes part in a game event, he will achieve one and only one grade
 - each game event belongs to one and only one category
 - each category is managed by one and only one manager
- (1) According to the descriptions mentioned above, list the functional dependency set F that holds on R (3 points)
- (2) List all the candidate keys of R . (2 points)
- (3) Give a lossless and dependency-preserving decomposition of R into 3NF. (5 points)

答案: