2.12

branch 的主码：branch_name，没有外码。

customer 的主码：（ID，customer_name），没有外码。

loan 的主码：loan_number。
外码：branch_name，参考自 branch 的 branch_name 属性。

borrower 的主码：（ID, loan_number）。
外码：ID，参考自 customer 的 ID 属性；
loan_number，参考自 loan 的 loan_number 属性。

account 的主码：account_number。
外码：branch_name，参考自 branch 的 branch_name 属性。

depositor 的主码：（ID，account_number）。
外码：ID，参考自 customer 的 ID 属性；
account_number，参考自 account 的 account_number 属性。

2.15

a. $\pi_{loan\_number}(\sigma_{amount>10000}(loan))$

b. $\pi_{ID}(depositor \bowtie (\sigma_{balance>6000}(account)))$

c. $\pi_{ID}(depositor \bowtie (\sigma_{branch\_name='Uptown' \cap balance>6000}(account)))$

3.15

a.

```
SELECT DISTINCT C.ID
FROM customer C
WHERE NOT EXISTS (
SELECT B.branch_name
FROM branch B
WHERE B.branch_city = 'Brooklyn' AND NOT EXISTS (
SELECT D.ID
FROM depositor D, account A
WHERE D.ID = C.ID AND D.account_number = A.account_number AND A.branch_name = B.branch_name ) );
```

b.

```
SELECT SUM(amount)
FROM loan
```

c.

```
SELECT DISTINCT B1.branch_name
FROM branch B1
WHERE B1.assets > (
SELECT MIN(B2.assets)
FROM branch B2
WHERE B2.branch_city = 'Brooklyn' );
```

3.22

```
WHERE (SELECT COUNT (DISTINCT title) FROM course) = (SELECT COUNT (title) FROM course)
```

3.28

```
SELECT DISTINCT T.name, T.ID
FROM instructor T, teaches E, course C
WHERE T.dept_name = C.dept_name AND E.course_id = C.course_id AND T.ID = E.ID
ORDER BY T.name;
```