Assignment-1 CS303

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1 Problem 1

The Schema of the table is as shown below

Branch (branch_name, branch_city, assets)
customer (customer_name, customer_street, customer_city)
loan (loan_number, branch_name, amount)
borrower (customer_name, loan_number)
account (account_number, branch_name, balance)
depositor (customer_name, account_number)

1.1 Sub Question (a)

1.1.1 Part (i)

To find the names of braches present in **Chicago**, we impose a condition on *branch_city* using table **Branch**. Projection can be used to get the names.

$$\prod_{branch\_name}(\sigma_{branch\_name="Chicago"}(Branch)) \tag{1}$$

1.1.2 Part (ii)

To solve this we take the cross product of **borrower** and **loan** tables and join them based on appropriate conditions. Projection is used to select the customer names.

$$\begin{aligned} &P_1 \equiv borrower.loan\_number = loan.loan\_number \\ &P_2 \equiv loan.branch\_name = "Downtown" \\ &\prod_{borrower.customer\_name}(\sigma_{P_1 \wedge\ P_2}(borrower \times loan)) \end{aligned} \tag{2}$$

1.2 Sub Question (b)

In this question I am assuming the following

- *customer_name* in **Customer** table are unique.
- Multiple Customers can be associated with the same loan (Joint Loans).
- One customer can take up multiple loans.
- Multiple people can open one acccount (Joint Account).
- One person can have only a single account number (As bank is the same in this case).

Table	Primary Key	Foreign Key
Branch	branch_name	–
customer	customer_name	–
loan	loan_number	branch_name ref. Branch
borrower	(customer_name, loan_number)	customer_name ref. customer loan_number ref. loan
account	account_number	branch_name ref. Branch
depositor	customer_name	customer_name ref. customer acccount_number ref. account

Table 1: Keys in the given Schema

1.3 Sub Question (c)

1.3.1 Part (i)

First use the select operator then project the *loan_numebr* on **loan** table.

$$\prod_{loan\_number}(\sigma_{amount>10000}(loan)) \tag{3}$$

1.3.2 Part (ii)

We first join *account* and *depositer* tables. Then we use the select and project operator.

$$\begin{aligned} &P_1 \equiv account.account\_number = depositor.account\_number \\ &P_2 \equiv account.balance > 6000 \\ &\prod_{depositor.customer\_name}(\sigma_{P_1 \wedge\ P_2}(account \times depositor)) \end{aligned} \tag{4}$$

1.3.3 Part (iii)

Similar to previous question, but we have another condition on branch_name.

$$
\begin{aligned}
&P_1 \equiv account.account\_number = depositor.account\_number \\
&P_2 \equiv account.balance > 6000 \\
&P_3 \equiv account.branch\_name = "Uptown" \\
&\prod_{depositor.customer\_name}(\sigma_{P_1 \wedge P_2 \wedge P_3}(account \times depositor))
\end{aligned} \tag{5}
$$

2 Problem 2

2.1 Part (i)

Selecting users whose age is more that 25.

Name
Victor
Jane

Table 2: Output

2.2 Part (ii)

Select users whose Id is greater than 2 or whose age is not 31.

Id	Name	Age	Gender	OccupationId	CityId
1	John	25	Male	1	3
2	Sara	20	Female	3	4
3	Victor	31	Male	2	5
4	Jane	27	Female	1	3

Table 3: Output

2.3 Part (iii)

Join tables *User* and *Occupation*.

Id	Name	Age	Gender	OccupationId	CityId	OccupationId	OccupationName
1	John	25	Male	1	3	1	Software Engineer
2	Sara	20	Female	3	4	3	Pharmacist
3	Victor	31	Male	2	5	2	Accountant
4	Jane	27	Female	1	3	3	Software Engineer

Table 4: Output

2.4 Part (iv)

Natural join tables *User*, *Occupation* and *City*.

Id	Name	Age	Gender	OccupationId	CityId	OccupationName	CityName
1	John	25	Male	1	3	Software Engineer	Boston
2	Sara	20	Female	3	4	Pharmacist	New York
3	Victor	31	Male	2	5	Accountant	Toronto
4	Jane	27	Female	1	3	Software Engineer	Boston

Table 5: Output

2.5 Part (v)

Name and gender of users who live in Boston.

Name	Gender
John	Male
Jane	Female

Table 6: Output