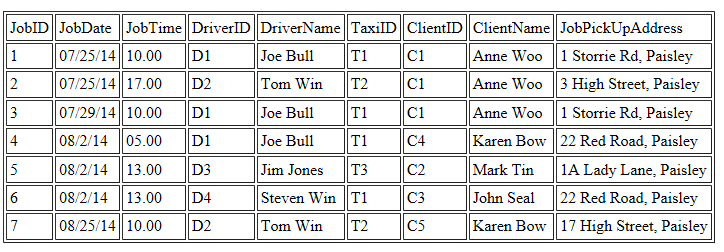
**Assignment – 3**

**PART – A**

**Design a normalized database schema (3NF)**



3NF

FAST CABS:

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **JobID** | JobDate | JobTime | DriverID | ClientID | JobPickUp  Address |
| Primary Key | Alternate Key |  | Foreign Key | Foreign Key |  |
| Integer | DateTime | DateTime | Varchar2 | Varchar2 | Varchar2(100) |
|  | Not NULL | Not NULL | Not NULL | Not NULL | Not NULL |
| 1 | 07/25/14 | 10.00 | D1 | C1 | 1 Storrie Rd, Paisley |
| 2 | 07/25/14 | 17.00 | D2 | C1 | 3 High Street, Paisley |
| 3 | 07/29/14 | 10.00 | D1 | C1 | 1 Storrie Rd, Paisley |
| 4 | 08/02/14 | 05.00 | D1 | C4 | 22 Red Road, Paisley |
| 5 | 08/02/14 | 13.00 | D3 | C2 | 1A Lady Lane, Paisley |
| 6 | 08/02/14 | 13.00 | D4 | C3 | 22 Red Road, Paisley |
| 7 | 08/25/14 | 10.00 | D2 | C5 | 17 High Street, Paisley |

Driver Details:

|  |  |  |  |
| --- | --- | --- | --- |
| **DriverID** | FirstName | LastName | TaxiID |
| Primary Key |  |  |  |
| Varchar2 | Varchar2 | Varchar2 | Varchar2 |
|  | Not Null | Not Null | Not Null |
| D1 | Joe | Bull | T1 |
| D2 | Tom | Win | T2 |
| D3 | Jim | Jones | T3 |
| D4 | Steven | Win | T1 |

Client Details:

|  |  |  |
| --- | --- | --- |
| **ClientID** | FirstName | LastName |
| Primary Key |  |  |
| Varchar2 | Varchar2 | Varchar2 |
|  | Not Null | Not Null |
| C1 | Anne | Woo |
| C2 | Mark | Tin |
| C3 | John | Seal |
| C4 | Karen | Bow |
| C5 | Karen | Bow |

**PART - B**

**Queries expressed in relational algebra:**

1. List all book titles.

Π (Title) (BOOK)

1. List all book titles published by "Addison Wesley".

Π (Title) (σ (Publisher\_Name = “Addison Wesley”) (BOOK))

1. List the book titles, and branch names, at each branch where all copies of that title are available for borrowing.

R1 ← π (BookID) (BOOK) – π (Book\_ID) (BOOK\_LOANS)

Π (Title, Branch\_name) ((((BOOK) ⋈ (BOOK.Book\_ID=R1.Book\_ID) (R1)) ⋈ (R1.Book\_ID=BOOK\_LOANS.Book\_ID) (BOOK\_LOANS)) ⋈ (BOOK\_LOANS.Branch\_ID=LIBRARY\_BRANCH.Branch\_ID) (LIBRARY\_BRANCH))

1. (b) How many copies of the book titled The Lost Tribe are owned by each library branch?

Π (No\_of\_copies, Title) (((σ (Title = ‘The Lost Tribe’) (BOOK)) ⋈ (Book.Book\_ID = BOOK\_COPIES.Book\_ID) (BOOK\_COPIES)) ⋈ (BOOK\_COPIES.Branch\_ID = LIBRARY\_BRANCH.Branch\_ID) (LIBRARY\_BRANCH))

1. (a) How many copies of the book titled The Lost Tribe are owned by the library branch whose name is "Sharpstown"?

Π (No\_of\_copies, Title, Branch\_name) (((σ (Title = ‘The Lost Tribe’) (BOOK)) ⋈ (Book.Book\_ID = BOOK\_COPIES.Book\_ID) (BOOK\_COPIES)) ⋈ (BOOK\_COPIES.Branch\_ID = LIBRARY\_BRANCH.Branch\_ID) (σ (Branch\_name =’Sharpstown’) (LIBRARY\_BRANCH)))

1. List the names of borrowers with overdue books. (Assume currentDate has today's date.)

Π (Name, Due\_date) ((BORROWER) ⋈ (BORROWER.Card\_no = BOOK\_LOANS.Card\_no) (σ (Due\_date = ‘10/02/2015’ (BOOK\_LOANS)))

1. (c) Retrieve the names of all borrowers who do not have any books checked out.

R1 ← Π (Card\_no) (BORROWER) – Π (Card\_no) (BOOK\_LOANS)

Π (card\_no, Name) (BORROWER ⋈ (BORROWER.Card\_no=R1.Card\_no) R1)

1. (d) For each book that is loaned out from the "Sharpstown" branch and whose due date is today, retrieve the book title, the borrower's name, and the borrower's address. (Assume currentDate has today's date.)

Π (Title, Name, Address) (((π (Book\_ID) (BOOK)) ⋈ (BOOK.Book\_ID = BOOK\_LOANS.Book\_ID) (σ (Due\_date = ‘10/02/2015’) (BOOK\_LOANS))) ⋈ (BOOK\_LOANS.Branch\_ID = LIBRARY\_BRANCH.Branch\_ID) (σ (Branch\_name = ‘Sharpstown’) (LIBRARY\_BRANCH)))

1. (g) For each book authored (or co-authored) by "Stephen King", retrieve the title and the number of copies owned by the library branch whose name is "Central".

Result1 ← (π (Author\_name, Book\_ID, Title) ((σ (Author\_name = ‘Stephen King’) (BOOK\_AUTHORS)) ⋈ (BOOK\_AUTHORS.Book\_ID = BOOK.BOOK\_ID) (BOOK)))

RESULT2 ← (π (No\_of\_copies, Branch\_name, Branch\_ID, Book\_ID) ((σ (Branch\_name=’Central’) (LIBRARY\_BRANCH)) ⋈ (LIBRARY\_BRANCH.Branch\_ID=BOOK\_COPIES.Branch\_ID) (BOOK\_COPIES)))

FINAL\_RESULT ← (π (Title, Author\_name, Branch\_name, No\_of\_copies) ((RESULT1) ⋈ (RESULT1.Book\_ID=RESULT2.Book\_D) (RESULT2)))

1. List all book titles that have been borrowed by "Peter Bloomfield".

Π (Title, Name) (((σ (Name = ‘PeterBloomfield’) (BORROWER)) ⋈ (BORROWER.Card\_no = BOOK\_LOANS.Card\_no) (BOOK\_LOANS)) ⋈ (BOOK\_LOANS.BOOK\_ID= BOOK.Book\_ID) (BOOK))