PART – A

The table shown below displays some details of client bookings for taxis.

JobID	JobDate	JobTime	DriverID	DriverName	TaxiID	ClientID	ClientName	JobPickUpAddress
1	7/25/2014	10	D1	Joe Bull	T1	C1	Anne Woo	1 Storrie Rd, Paisley
2	7/25/2014	17	D2	Tom Win	T2	C1	Anne Woo	3 High Street, Paisley
3	7/29/2014	10	D1	Joe Bull	T1	C1	Anne Woo	1 Storrie Rd, Paisley
4	8/02/2014	05	D1	Joe Bull	T1	C4	Karen Bow	3 High Street, Paisley
5	8/02/2014	13	D3	Jim Jones	T3	C2	Mark Tin	1A Lady Lane, Paisley
6	8/02/2014	13	D4	Steven Win	T1	C3	John Seal	22 Red Road, Paisley
7	8/25/2014	10	D2	Tom Win	T2	C5	Karen Bow	17 High Street, Paisley

NORMALIZED FORM

JobID	JobDate	JobTime	DriverID	TaxiID	ClientID	JobPickUpAddress
1	7/25/2014	10	D1	T1	C1	1 Storrie Rd, Paisley
2	7/29/2014	10	D1	T1	C1	1 Storrie Rd, Paisley
3	8/30/2014	11	D2	T2	C1	3 High Street, Paisley
4	8/02/2014	13	D3	T3	C2	1A Lady Lane, Paisley
5	8/02/2014	13	D4	T1	C3	22 Red Road, Paisley
6	8/25/2014	10	D2	T2	C4	17 High Street, Paisley
7	8/25/2014	10	D2	T2	C4	17 High Street, Paisley

CLIENT DETAILS

ClientID (PK)	Varchar(10)	NOT NULL
Client_Name	char(50)	not null

CLIENT DETAILS

ClientID	Client_Name
C1	Anne Woo
C2	Mark Tin
C3	John Seal
C4	Karen Bow

DRIVER DETAILS

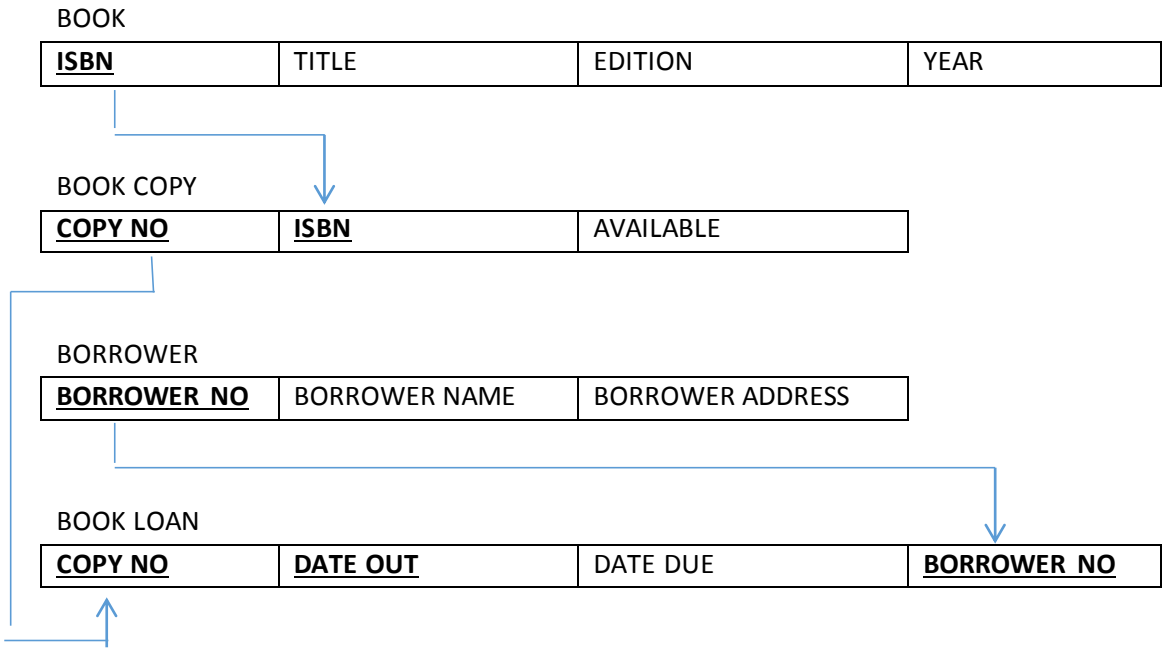
DRIVERID (PK)	Varchar(10)	NOT NULL
Driver_Name	char(50)	not null

DRIVER DETAILS

DriverID	Driver_Name
D1	Joe Bull
D2	Tom Win
D3	Jim Jones
D4	Steven Win

FAST CAB		
Column Name	Data Type	Constraints
JobID – PK	INT	not NULL
JobDate - FK	INT	not NULL
JobTime	INT	not NULL
DriverID –FK	varchar(10)	not NULL
TaxiID	varchar(10)	not NULL
ClientID - FK	varchar(10)	not NULL
JobPickUpAddress	varchar(100)	not NULL

2)


BOOK
ISBN
TITLE
EDITION
YEAR
BOOK COPY
COPY NO
ISBN
AVAILABLE
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BORROWER NO
BORROWER NAME
BORROWER ADDRESS
BOOK LOAN
COPY NO
DATE OUT
DATE DUE
BORROWER NO

PART – B

1. List all book titles.

$\pi_{\text{Title}}(\text{BOOK})$

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

RESULT 1 $\leftarrow (\sigma_{\text{Name = 'Addison Wesley'}}(\text{PUBLISHER}))$
FINAL $\leftarrow \pi_{\text{Title}}(\text{RESULT1})$

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

Result1 $\leftarrow \pi_{\text{ISBN, copy-no}}(\text{BOOK COPY})$ BOOK COPY.ISBN = BOOK.ISBN $(\pi_{\text{ISBN, title}}(\text{BOOK}))$
FINAL $\leftarrow (\pi_{\text{Branch\_name}}(\text{Library\_Branch}) \bowtie \text{Result1})$

OR

Result1 $\leftarrow (\pi_{\text{title}}(\text{Book})) \bowtie$ Book.ISBN = BookCopy.ISBN $(\sigma_{\text{available = 'yes'}}(\text{BookCopy}))$

Final $\leftarrow (\pi_{\text{Branch\_name}}(\text{Library\_Branch}) \bowtie \text{Result1})$

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

RESULT 1 $\leftarrow (\sigma_{\text{Title = 'The Lost Tribe'}}(\text{BOOK})) \bowtie$ BOOK_COPIES
FINAL $\leftarrow \pi_{\text{Branch\_id, No\_of\_copies}}(\text{RESULT1})$

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

RESULT 1 $\leftarrow \pi_{\text{Branch\_id}}(\sigma_{\text{Branch\_name = 'Sharpstown'}}(\text{LIBRARY\_BRANCH}))$
RESULT 2 $\leftarrow \pi_{\text{Book\_id}}((\sigma_{\text{Title='The Lost Tribe'}}(\text{BOOK}))$
FINAL $\leftarrow \pi_{\text{No\_of\_copies}}(\text{BOOK\_COPIES} \bowtie \text{RESULT 1} \bowtie \text{RESULT 2})$

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

RESULT 1 ← σ name (BORROWER)
FINAL ← π Card_no, due_date<10/04/2015 (Book_loans) ⋈ RESULT 1

OR

π Borrower.borrowerName (Borrower)) ⋈ Borrower.borrowerNo = BookLoan.borrowerNo (σ duedate < 10/04/2015 (BorrowerLoan))

OR

FINAL← π BORROWER Name (Result1) ← π (BORROWER NAME,_BORROWER NO **(BORROWER)) ⋈ BORROWER.** BORROWER NO = BOOK LOAN**.** BORROWER NO (π BORROWER NO, due_date (σ < due_date =10/04/2015 > (BOOK LOAN))

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

RESULT 1 ← π Card_no (BORROWER) - π Card_no (BOOK_LOANS)
FINAL ← π Name (BORROWER ⋈ RESULT 1)

8. (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.)

RESULT 1 ← π Branch_id (σ Branch_name = 'Sharpstown' (LIBRARY_BRANCH))
RESULT 2 ← π Book_id, Card_no ((σ Due_date='10/04/2015' (BOOK_LOANS)) ⋈ RESULT 1)
FINAL ← π Title, Name, Address (BOOK ⋈ BORROWER ⋈ RESULT 2)

9. (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".

RESULT 1 ← π Book_id, Title (σ Author_name='Stephen King' (BOOK_AUTHORS)) ⋈ BOOK)
RESULT 2 ← π Branch_id (σ Branch_name='Central' (LIBRARY_BRANCH))
FINAL ← π Title, No_of_copies (RESULT 1 ⋈ RESULT 2 ⋈ BOOK_COPIES)

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

π Title (Book)) ($\bowtie$ Book.ISBN = BookCopy.ISBN ($\bowtie$ BookCopy.copyNo = BookLoan.copyNo ($\bowtie$ BookLoan.borrowerNo = Borrower.borrowerName (σ Borrower.borrowerName = 'Peter Bloomfield' (Borrower)))))

$\bowtie \sigma \rho \pi$