

**Bachelor of Software Engineering  
Centre for IT Education (CITES)  
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The Open University of Sri Lanka**

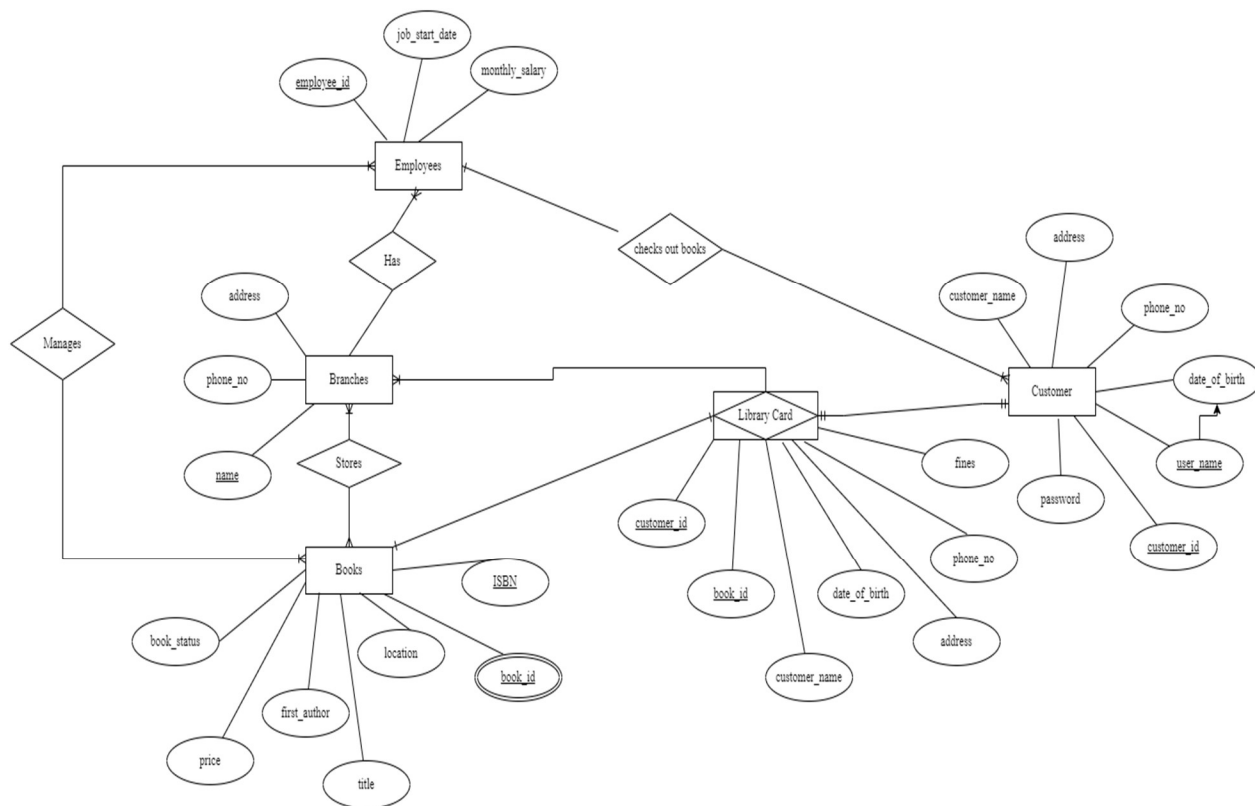
**EEI3266 – Information Systems and Data Management**

# **Case Study Submission**

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**Q1)** Draw an ER diagram to depict your database. In this diagram, indicate all the entities, relationships (weak & strong), relationship cardinalities and participations, attributes, and primary keys. In addition, specify whether each attribute is single-valued or multi-valued, stored or derived, and atomic or composite.



**Figure 1 : ER diagram of a Library System**

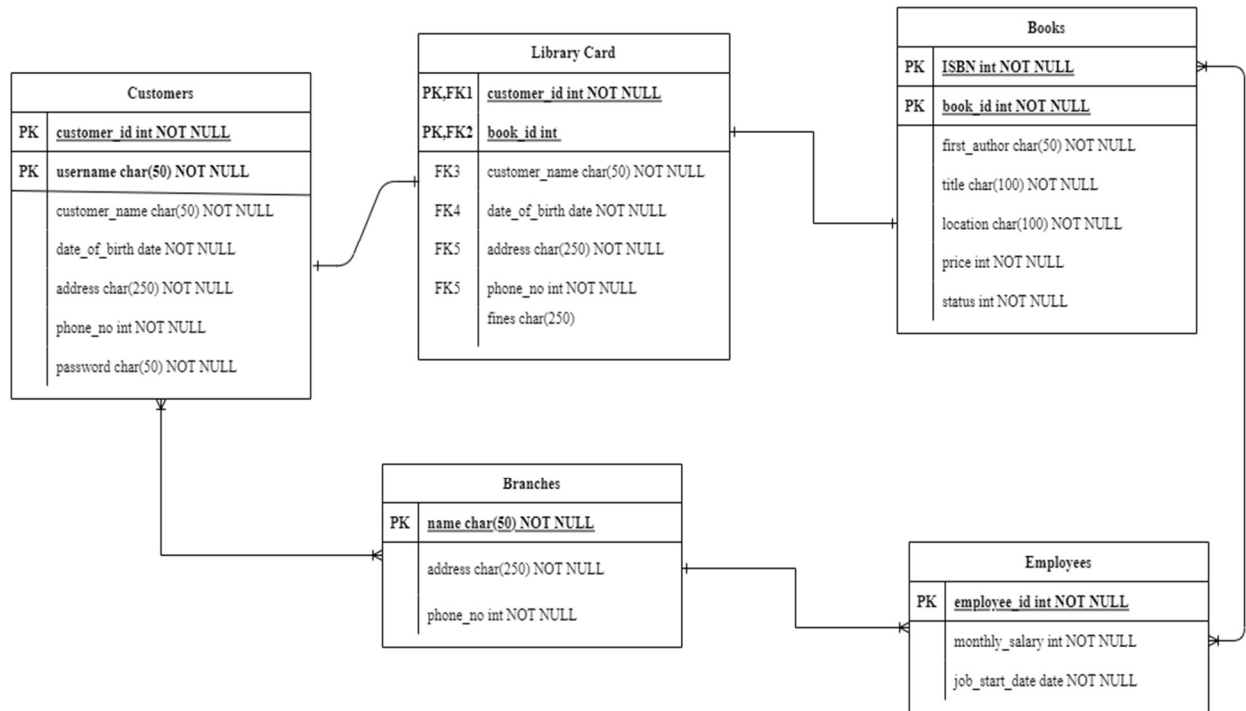
**Assumptions :**

- one customer can borrow only one book at a time.
- one customer can use their library card for every branch of the library.

**Q2)** Define the actors in the library system and their functions.

Actors	Functions
Branches	Storing books, Keeping Library Cards
Books	
Customers	Signing up to a Library Card, Borrowing Books
Employees	Working for a Library Branch,
Library Card	Storing data of Customers

**Q3)** Convert the above ER diagram into relational model (tables) and then store the tables in the MySQL database. Write the relational Database Schema. Also make sure that you have populated (inserted) sufficient data into the database in order to test your schemas.



**Figure 2.1 : Relational Database Schema of a Library System**

## Customers

<u>customer_id</u>	<u>username</u>	name	date_of_birth	address	phone_no	password
1	abcd	Ava	14/12/1989	32, Old Butchers Street, 11 Colombo	07155518	123wx
2	efgh	Noah	08/04/1990	135, Old Moor Street, 12 Colombo	07255565	456yz
3	ijkl	Olivia	23/09/1991	150, Stace Road, 14 Colombo	07055555	789ab
4	mnop	Emma	09/12/1991	222, Keyzer Street, 11 Colombo	07655568	987cd
5	qrst	Liam	18/07/1993	438, Deans Road, 10 Colombo	07555520	654ef
6	uvxy	Lucas	15/05/1990	255, Main Street, 11 Colombo	07155578	321jk

**Figure 2.2 : Table of customers**



### Library Card

<u>customer_id</u>	customer_name	date_of_birth	address	phone_no	book_id	finer
1	Ava	14/12/1989	32, Old Butchers Street, 11 Colombo	07155518	3	500
2	Noah	08/04/1990	135, Old Moor Street, 12 Colombo	07255565	4	
3	Olivia	23/09/1991	150, Stace Road, 14 Colombo	07055555		
4	Emma	09/12/1991	222, Keyzer Street, 11 Colombo	07655568	5	50
5	Liam	18/07/1993	438, Deans Road, 10 Colombo	07555520		
6	Lucas	15/05/1990	255, Main Street, 11 Colombo	07155578	6	50

**Figure 2.3 : Table of library card**

## Books

ISBN	book_id	first_author	title	location	price	status
9780141199610	1	Leo Tolstoy	Anna Karenina	2nd floor (142.780973 C826e)	3,000	1
9780141441146	2	Charlotte Bronte	Jane Eyre	1st floor (851.963472 S054t)	500	1
9780141441146	3	Charlotte Bronte	Jane Eyre	1st floor (952.408631 H703t)	500	2
9780230633193	4	Charles Dickens	Great Expectations	2nd floor (806.549821 G018e)	100	1
9780141441146	5	William Shakespeare	Hamlet	ground floor (PS3608.O832 K58 2003)	50	2
9780141441146	6	William Shakespeare	Hamlet	ground floor (PS4535.B593 F46 8900)	50	2

**Figure 2.4 : Table of books**

## Branches

<u>name</u>	address	phone_no
Codex Library	149, 4th Cross Street, 11 Colombo	( 011) 2431206
Central Park Library	219, Panchikawatte Road, 10 Colombo	( 011) 2421554
Reader's Garden Library	28, Jethawana Road, 14 Colombo	( 011) 2451975
Legacy Library	24, Deal Place, 03 Colombo	( 011) 2324974
Prime Library	323 1/1, Dam Street, 12 Colombo	( 011) 2439290

**Figure 2.5 : Table of branches**

## Employees

<u>employee_id</u>	job_start_date	monthly_salary
1	23/01/2018	43,400
2	10/12/2018	43,400
3	04/03/2019	32,500
4	15/04/2019	32,500
5	31/05/2021	28,600

**Figure 2.6 : Table of employees**

**Q4)** Write SQL statements to create the tables and add records to each table in your database with sufficient data for testing.

Figure 3.1 : Screenshot of the Library\_Customers table in SQL

Query 1Administration - Performance Re...lib\_card - Tablelib\_carrd - Tablelibrary\_carrd - Table

Figure 3.2 : Screenshot of the Library\_Card table in SQL

```

34 );
35
36 • INSERT INTO Library_Books VALUES
37 ("9780141199610",1,"Leo Tolstoy","Anna Karenina","2nd floor (142.780973 C826e)",3000,"1"),
38 ("9780141441146",2,"Charlotte Bronte","Jane Eyre","1st floor (851.963472 S054t)",500,"1"),
39 ("9780141441146",3,"Charlotte Bronte","Jane Eyre","1st floor (952.408631 H703t)",500,"2"),
40 ("9780230633193",4,"Charles Dickens","Great Expectations","2nd floor (806.549821 G018e)",100,"1"),
41 ("9780141441146",5,"William Shakespeare","Hamlet","ground floor(PS3608.0832 K58 2003)",50,"2"),
42 ("9780141441146",6,"William Shakespeare","Hamlet","ground floor(PS4535.B593 F46 8900)",50,"2");
43
44 • SELECT * FROM Library_Books ;
45

```

ISBN	book_id	first_author	title	location	price	book_status
9780141199610	1	Leo Tolstoy	Anna Karenina	2nd floor (142.780973 C826e)	3000	1
9780141441146	2	Charlotte Bronte	Jane Eyre	1st floor (851.963472 S054t)	500	1
9780141441146	3	Charlotte Bronte	Jane Eyre	1st floor (952.408631 H703t)	500	2
9780230633193	4	Charles Dickens	Great Expectations	2nd floor (806.549821 G018e)	100	1
9780141441146	5	William Shakespeare	Hamlet	ground floor(PS3608.0832 K58 2003)	50	2
9780141441146	6	William Shakespeare	Hamlet	ground floor(PS4535.B593 F46 8900)	50	2
NULL	NULL	NULL	NULL	NULL	NULL	NULL

Figure 3.3 : Screenshot of the Library\_Books table in SQL

```

48 address varchar(500),
49 phone_no varchar(50)
50 );
51
52 • INSERT INTO Library_Branches VALUES
53 ("Codex Library","149, 4th Cross Street, 11 Colombo","( 011) 2431206"),
54 ("Central Park Library","219, Panchikawatte Road, 10 Colombo","( 011) 2421554"),
55 ("Reader's Garden Library","28,Jethawana Road, 14 Colombo","( 011) 2451975"),
56 ("Legacy Library","24, Deal Place, 03 Colombo","( 011) 2324974"),
57 ("Prime Library","323 1/1, Dam Street, 12 Colombo","( 011) 2439290");
58
59 • SELECT * FROM Library_Branches ;

```

branch_name	address	phone_no
Codex Library	149, 4th Cross Street, 11 Colombo	( 011) 2431206
Central Park Library	219, Panchikawatte Road, 10 Colombo	( 011) 2421554
Reader's Garden Library	28,Jethawana Road, 14 Colombo	( 011) 2451975
Legacy Library	24, Deal Place, 03 Colombo	( 011) 2324974
Prime Library	323 1/1, Dam Street, 12 Colombo	( 011) 2439290

Figure 3.4 : Screenshot of the Library\_Branches table in SQL

64 job\_start\_date date ,  
 65 monthly\_salary varchar(50)  
 66 );  
 67  
 68 • INSERT INTO Library\_Employees VALUES  
 69 (1,20180123,"43,400"),  
 70 (2,20181210,"43,400"),  
 71 (3,20190304,"32,500"),  
 72 (4,20190415,"32,500"),  
 73 (5,20210531,"28,600");  
 74  
 75 • SELECT \* FROM Library\_Employees ;

Result Grid | Filter Rows: | Edit: | Export/Imports: | Wrap Cell Contents: |

	employee_id	job_start_date	monthly_salary
▶	1	2018-01-23	43,400
	2	2018-12-10	43,400
	3	2019-03-04	32,500
	4	2019-04-15	32,500
	5	2021-05-31	28,600
•	HIDE	HIDE	HIDE

Library\_Employees 7 x | Apply

**Figure 3.5 : Screenshot of the Library\_Employees table in SQL**

**Q5)** Write a SQL query to obtain the following results.



- i) To find the status of a given book.

The screenshot shows a database query tool interface. The top pane contains SQL queries for finding the status of the book 'Great Expectations'. The bottom pane shows a result grid with the following data:

book_id	title	book_status
4	Great Expectations	2
NULL	NULL	NULL

The interface also includes a toolbar with various icons, a 'Limit to 1000 rows' dropdown, and a sidebar with options like 'Result Grid', 'Form Editor', and 'Field Types'.

**Figure 4.1 : Status of the book, ‘Great Expectations’**

- ii) To view the customer card by giving the Customer ID.

The screenshot shows a database query tool interface. The top pane contains two SQL queries. The first query selects all records from the Library\_Books table where the title is 'Great Expectations'. The second query selects all records from the Library\_Card table where the customer\_id is 4. The bottom pane displays a result grid with one row of data for Customer 4. The grid has columns for customer\_id, customer\_name, date\_of\_birth, address, phone\_no, book\_id, and fines. The data row shows customer\_id 4, customer\_name Emma, date\_of\_birth 1991-12-09, address 222, Keyzer Street, 11 Colombo, phone\_no 07655568, book\_id 5, and fines 50. The interface also includes a toolbar with icons for file operations, a 'Limit to 1000 rows' dropdown, and a sidebar with options for 'Result Grid', 'Form Editor', and 'Field Types'.

```
113
114 • SELECT * FROM Library_Books
115 WHERE title='Great Expectations' ;
116
117 • SELECT * FROM Library_Card
118 WHERE customer_id='4' ;
119
```

customer_id	customer_name	date_of_birth	address	phone_no	book_id	fines
4	Emma	1991-12-09	222, Keyzer Street, 11 Colombo	07655568	5	50

**Figure 4.2 : Customer Card details of Customer 4**

- iii) Remove a book from the library with all its copies.

The screenshot shows a database management interface. At the top, there's a tab labeled 'Query 1' and a window title 'Administration - Performance Re...'. Below the title bar is a toolbar with various icons. The main area displays SQL queries:

```
95 WHERE title='Great Expectations';
96
97 • SET SQL_SAFE_UPDATES = 0;
98
99 • DELETE FROM Library_Books WHERE title='Hamlet' ;
100
101 • SELECT * FROM Library_Books ;
```

Below the queries is a 'Result Grid' section. It has a 'Filter Rows' input field and buttons for 'Edit', 'Export/Import', and 'Wrap Cell Content'. The grid displays the following data:

ISBN	book_id	first_author	title	location	price	book_status
9780141199610	1	Leo Tolstoy	Anna Karenina	2nd floor (142.780973 C826e)	3000	1
9780141441146	2	Charlotte Bronte	Jane Eyre	1st floor (851.963472 S054t)	500	1
9780141441146	3	Charlotte Bronte	Jane Eyre	1st floor (952.408631 H703t)	500	2
9780230633193	4	Charles Dickens	Great Expectations	2nd floor (806.549821 G018e)	100	1
NULL	NULL	NULL	NULL	NULL	NULL	NULL

On the right side of the interface, there are buttons for 'Result Grid', 'Form Editor', and 'Field Types'. At the bottom, there's a tab labeled 'Library\_Books5' and an 'Apply' button.

**Figure 4.3 :** Updated table after removing the book, 'Hamlet' from the library

iv) Change the status of a book.

The screenshot shows a database management interface. At the top, a query editor displays the following SQL code:

```
102
103 • UPDATE Library_Books
104   SET book_status='2'
105   WHERE title='Great Expectations' ;
106
107 • SELECT * FROM Library_Books
108   WHERE title='Great Expectations' ;
```

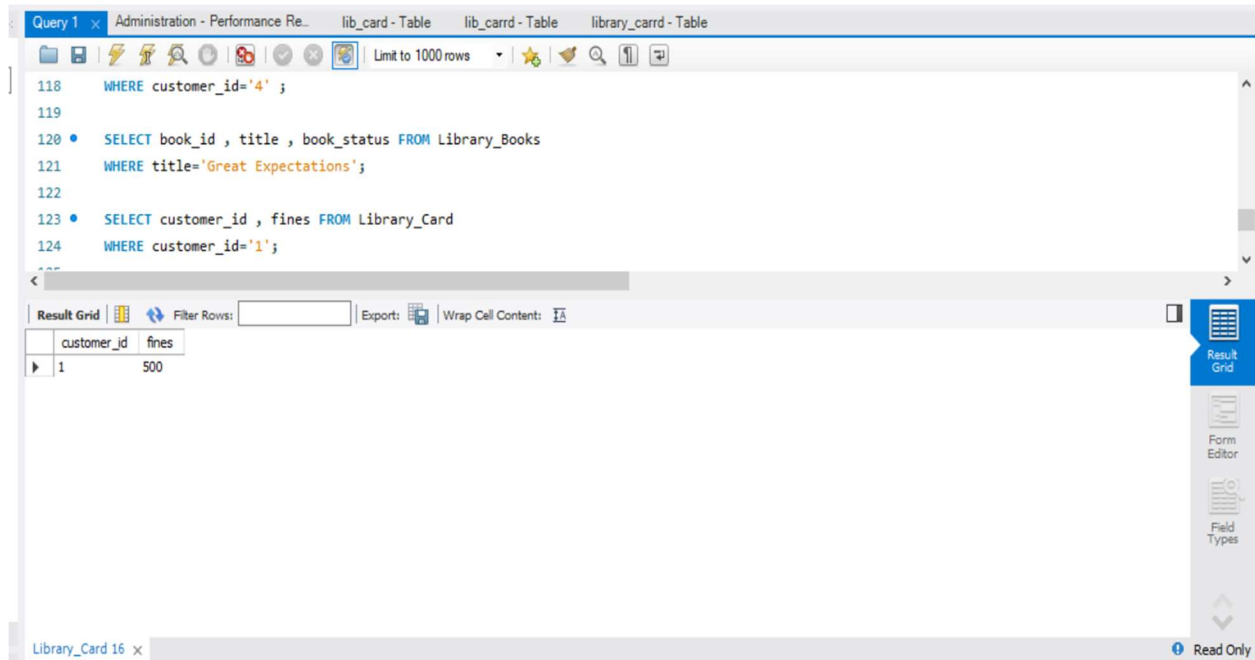
Below the query editor, a 'Result Grid' shows the results of the query. The grid has the following columns: ISBN, book\_id, first\_author, title, location, price, and book\_status. The first row shows the book 'Great Expectations' by Charles Dickens, with a price of 100 and a status of 2. The second row shows a row with all NULL values.

ISBN	book_id	first_author	title	location	price	book_status
9780230633193	4	Charles Dickens	Great Expectations	2nd floor (806.549821 G018e)	100	2
NULL	NULL	NULL	NULL	NULL	NULL	NULL

The interface also includes a sidebar on the right with options like 'Result Grid', 'Form Editor', and 'Field Types'. At the bottom, there is a tab labeled 'Library\_Books7' and an 'Apply' button.

**Figure 4.4 : The book, ‘Great Expectations’ after changing the status to 2 (checked out)**

- v) View the total amount of fines the customer has to pay.



**Figure 4.5 : The total amount of fines, Customer 1 has to pay**