

**Department of Electrical and Computer Engineering**

| Course Number | CPS510 |
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| Course Title | Database Systems I |
| Semester/Year | F2022 |
| Instructor | Dr. S. B. Tajali |
| Lab Section | 7 |

| Assignment No. | 8 |
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| Assignment Title | Assignment 8: Normalization/BCNF |

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Book(ISBN, BookTItle, AuthorLName, AuthorFName, CategoryId, Lang, ShelfId, BorrowerId)

Category(CategoryId, CategoryName)

Client(ClientId, ClientLName, ClientFName, BorrowedDate, DueDate, ReturnDate, IssuedBy)

Shelf(ShelfId, CategoryId, Floor)

Staff(StaffLName, StaffFName, StaffId, Admin, Designation)

Book(I, Bt, Al, Af, C, L, S, Br)

Category(Ci, Cn)

Client(Ci, Cl, Cf, Bd, Dd, Rd, Ib)

Shelf(Si, Ci, F)

Staff(Sl, Sf, Si, A, D)

Applying Bernstein’s Algorithm to Client:

Step 1, we identify the following attributes:

Client(Ci, Cl, Cf, Bd, Dd, Rd, Ib)

Ci = ClientId

Cl = ClientLName

Cf = ClientFName

Bd = BorrowedDate

Dd = DueDate

Rd = ReturnDate

Ib = IssuedBy

Step 2, these are the following functional dependencies:

Ci -> Cl, Cf

Ci, Bd -> Dd

Ci -> Rd

Upon inspection, IssuedBy does not belong this table as it is not functionally dependent on anything in this table and was decomposed to another table (BorrowedBooks)

Substep 1, rewriting to account for 1 RHS:

Ci -> Cl

Ci -> Cf

Ci, Bd -> Dd

Ci -> Rd

Because there is no repetition of RHS, Ci is the candidate key.

Step 3

Possible keys:

{Cl, Cf}

{Ci}

Because Ci -> Cl and Ci -> Cf, Ci is the suitable candidate key.

Step 4

Final relational schema:

Client(Ci, Cl, Cf)

Final Relational Schema:

Book(ISBN -> BookTitle, AuthorLname, AuthorFname, CategoryId, Lang)

BorrowedBooks(ReceiptID -> IssuedBy, ISBN, BorrowerID, BorrowerDate, DueDate)

Category(CategoryId -> CategoryName)

Client(ClientId -> ClientLname, ClientFname)

Shelf(ShelfId -> CategoryId, Floor)

Staff(StaffId -> StaffLname, StaffFname, Admin, Designation)