

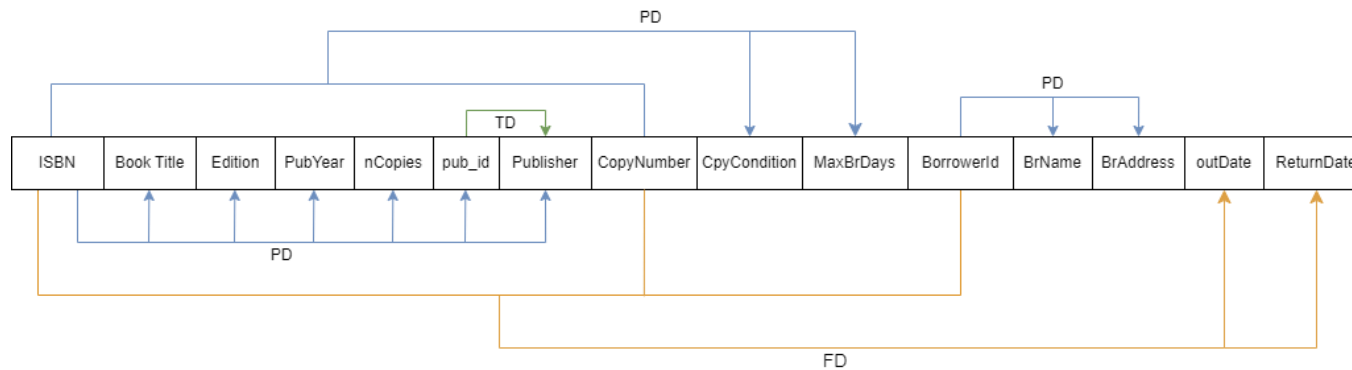
Vernice Tanquerido

CIDM 6350

Assignment #3 Tasks 1-3

Task 1: FDD and 1NF

a.)



b.)

ISBN	BookTitle	Edition	PubYear	nCopies	pub_id	Publisher	CopyNumber	CpyCondition	MaxBrDays	BorrowerId	BrName	BrAddress	outDate	ReturnDate
507014976-8	The Legend of Lizzie Borden	2	2016	2	3	Hills and Sons	2	poor	5	26	Bevan Bantick	09 Jay Street	2021-12-09	2021-12-14
517680829-3	Fermat's Room	1	1998	3	1	Wyman-Hilll	2	Good	15	26	Bevan Bantick	09 Jay Street	2022-05-20	2022-05-28
							1	New	15	35	Nalani Eim	56 Fair Oaks Street	2022-05-27	2022-06-11
							2	Good	15	40	Lena Hintzer	0 Buena Vista Drive	2022-08-05	2022-08-10
							1	New	15	89	Noak Leinthall	18523 Jenna Junction	2021-02-26	2021-03-04
747439731-5	The Fantastic Four	1	2015	3	1	Wyman-Hilll	1	Fair	10	28	Patty Caunter	48845 Fuller Drive	2020-11-17	2020-11-27
							1	Fair	10	35	Nalani Eim	56 Fair Oaks Street	2022-01-23	2022-01-28

Insert anomaly: When entering new entries, inconsistencies may occur with existing borrower's information (BorrowerId, BrName, BrAddress)

Update anomaly: When the cpycondition, maxbrdays, and a borrower's address is updated, all other entries must also be updated and inconsistencies may occur.

Delete anomaly: When an entry is deleted, borrower's information that do not have any other transaction will also be deleted.

c.) The relation Booklib is not in 1NF because there are non-atomic values in some of the cells.

d.) 1.

PK						
ISBN	BookTitle	Edition	PubYear	nCopies	pub_id	Publisher
507014976-8	The Legend of Lizzie Borden	2	2016	2	3	Hills and Sons
517680829-3	Fermat's Room	1	1998	3	1	Wyman-Hilll
747439731-5	The Fantastic Four	1	2015	3	1	Wyman-Hilll

Report schema:

Book_Info(ISBN, BookTitle, Edition, PubYear, nCopies, pub_id, Publisher)

Functional dependencies (FD):

FD1 (Transitive Dependency): pub_id → Publisher

PK, FK	PK				PK			
ISBN	CopyNumber	CpyCondition	MaxBrDays	BorrowerId	BrName	BrAddress	outDate	ReturnDate
507014976-8	2	poor	5	26	Bevan Bantick	09 Jay Street	2021-12-09	2021-12-14
517680829-3	2	Good	15	26	Bevan Bantick	09 Jay Street	2022-05-20	2022-05-28
517680829-3	1	New	15	35	Nalani Eim	56 Fair Oaks Street	2022-05-27	2022-06-11
517680829-3	2	Good	15	40	Lena Hintzer	0 Buena Vista Drive	2022-08-05	2022-08-10
517680829-3	1	New	15	89	Noak Leinthall	18523 Jenna Junction	2021-02-26	2021-03-04
747439731-5	1	Fair	10	28	Patty Caunter	48845 Fuller Drive	2020-11-17	2020-11-27
747439731-5	1	Fair	10	35	Nalani Eim	56 Fair Oaks Street	2022-01-23	2022-01-28

Report schema:

Borrow(ISBN, CopyNumber, CpyCondition, MaxBrDays, BorrowerId, BrName, BrAddress, outDate, ReturnDate)

Functional dependencies (FD):

FD1 (Partial dependency): ISBN, CopyNumber → CpyCondition, MaxBrDays

FD2 (Partial dependency): BorrowerId → BrName, BrAddress

FD3 (Full dependency): ISBN, CopyNumber, BorrowerId → outDate, ReturnDate

Task 2: 2NF

- a.) The first table, Book_Info, is already in 2NF because it does not have any partial dependencies while the Borrow table is still in 1NF because of its partial dependencies.

PK, FK	PK		
ISBN	CopyNumber	CpyCondition	MaxBrDays
507014976-8	2	poor	5
517680829-3	2	Good	15
517680829-3	1	New	15
517680829-3	2	Good	15
517680829-3	1	New	15
747439731-5	1	Fair	10

PK		
BorrowerId	BrName	BrAddress
26	Bevan Bantick	09 Jay Street
35	Nalani Eim	56 Fair Oaks Street
40	Lena Hintzer	0 Buena Vista Drive
89	Noak Leinthall	18523 Jenna Junction
28	Patty Caunter	48845 Fuller Drive

PK, FK	PK	PK		
ISBN	CopyNumber	BorrowerId	outDate	ReturnDate
507014976-8	2	26	2021-12-09	2021-12-14
517680829-3	2	26	2022-05-20	2022-05-28
517680829-3	1	35	2022-05-27	2022-06-11
517680829-3	2	40	2022-08-05	2022-08-10
517680829-3	1	89	2021-02-26	2021-03-04
747439731-5	1	28	2020-11-17	2020-11-27
747439731-5	1	35	2022-01-23	2022-01-28

PK						
ISBN	BookTitle	Edition	PubYear	nCopies	pub_id	Publisher
507014976-8	The Legend of Lizzie Borden	2	2016	2	3	Hills and Sons
517680829-3	Fermat's Room	1	1998	3	1	Wyman-Hilll
747439731-5	The Fantastic Four	1	2015	3	1	Wyman-Hilll

- b.) 1NF: Borrow(ISBN, CopyNumber, CpyCondition, MaxBrDays, BorrowerId, BrName, BrAddress, outdate, ReturnDate)

R (A , B , X , C , Y , Z)

Given relation R with PK (A,B,C) and partial dependency such as:

- R (A, B, X, C, Y, Z) and X partially dependent on A,B (A,B → X)
- R (A, B, X, C, Y, Z) and Y partially dependent on C (C → Y)

Decompose as follows:

- R1 (A, B, X) Functional dependency: Full dependency (A, B → X)
- R2 (C, Y,) Functional dependency: Full dependency (C → Y)
- R3 (A, B, C, Z) Functional dependency: Full dependency (A, B, C → Z)

- c.) Schema for each 2NF relation:

- Book_status (ISBN, CopyNumber, CpyCondition, MaxBrDays)

PK: ISBN, CopyNumber

- Borrower (BorrowerId, BrName, BrAddress) PK: BorrowerId
- Borrow_Date (ISBN, CopyNumber, BorrowerId, OutDate, ReturnDate) PK: ISBN, CopyNumber, BorrowerId
- Book_Info(ISBN, BookTitle, Edition, PubYear, nCopies, pub_id, Publisher) PK: ISBN

Task 3: 3NF

- a.) All relations decomposed in task 2 (Book_status, Borrower, Borrow_Date) are already in 3NF because there are no functional dependencies on non-primary key attributes. The first relation from task 1 (Book_Info), however, is still in 2NF due to the transitive dependency of the publisher attribute to the pub_id attribute.

PK, FK	PK, FK		
<u>ISBN</u>	<u>CopyNumber</u>	CpyCondition	MaxBrDays
507014976-8	2	poor	5
517680829-3	2	Good	15
517680829-3	1	New	15
747439731-5	1	Fair	10

PK, FK	PK, FK	PK, FK		
<u>ISBN</u>	<u>CopyNumber</u>	<u>BorrowerId</u>	outDate	ReturnDate
507014976-8	2	26	2021-12-09	2021-12-14
517680829-3	2	26	2022-05-20	2022-05-28
517680829-3	1	35	2022-05-27	2022-06-11
517680829-3	2	40	2022-08-05	2022-08-10
517680829-3	1	89	2021-02-26	2021-03-04
747439731-5	1	28	2020-11-17	2020-11-27
747439731-5	1	35	2022-01-23	2022-01-28

PK, FK					FK
<u>ISBN</u>	BookTitle	Edition	PubYear	nCopies	<u>pub_id</u>
507014976-8	The Legend of Lizzie Borden	2	2016	2	3
517680829-3	Fermat's Room	1	1998	3	1
747439731-5	The Fantastic Four	1	2015	3	1

PK, FK		
<u>BorrowerId</u>	BrName	BrAddress
26	Bevan Bantick	09 Jay Street
35	Nalani Eim	56 Fair Oaks Street
40	Lena Hintzer	0 Buena Vista Drive
89	Noak Leinthall	18523 Jenna Junction
28	Patty Caunter	48845 Fuller Drive

PK, FK	
<u>pub_id</u>	Publisher
3	Hills and Sons
1	Wyman-Hilll

- b.) 2NF: Book_Info(ISBN, BookTitle, Edition, PubYear, nCopies, pub_id, Publisher)

$$R \left(\underline{A}, \overbrace{\hspace{2cm}}^X, Y, Z \right)$$

Given the relation R with PK (A) and transitive dependency such that:

- $R(\underline{A}, X, Y, Z)$ where Z is functionally dependent on A through Y ($\underline{A} \rightarrow Y \rightarrow Z$)

Remove Z from the original table:

- R1 (A, X, Y) Functional dependency: Full dependency (A → X, Y)

Create a new table with Y as the primary key and Z functionally dependent on Y

- R2 (Y, Z) Functional dependency: Full dependency (Y → Z)

c.) 3NF relations:

- | | |
|--|----------------------------------|
| • Book (<u>ISBN</u> , BookTitle, Edition, PubYear, nCopies, pub_id) | PK: ISBN |
| • Publisher (<u>pub_id</u> , Publisher) | PK: pub_id |
| • Book_status (<u>ISBN</u> , <u>CopyNumber</u> , CpyCondition, MaxBrDays) | PK: ISBN, CopyNumber |
| • Borrower (<u>BorrowerId</u> , BrName, BrAddress) | PK: BorrowerId |
| • Borrow_Date (<u>ISBN</u> , <u>CopyNumber</u> , <u>BorrowerId</u> , OutDate, ReturnDate) | PK: ISBN, CopyNumber, BorrowerId |