

Task A

For this task, we have to check 5 tables about their accordance toward BCNF.

Book

book_ID	book_name	author	Type_g (Genre)	pub_year (Publish year)	langua (Language)
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There are 5 FDs. $\text{book_ID} \rightarrow \text{book_name}$. $\text{book_ID} \rightarrow \text{author}$. $\text{book_ID} \rightarrow \text{type_g}$. $\text{book_ID} \rightarrow \text{pub_year}$. $\text{book_ID} \rightarrow \text{language}$

book_ID is the primary key and a super key, making the table BCNF.

We treated book_ID as a simplified noted ISBN so we do not have to match that many digits throughout the project. This means that book_name will not have a transitive FD downward to others because everything depends on the book_ID . We choose not to use book_name as the primary key due to the fact that book_name can have the same value even for different books.

Copies

book_ID	copy_ID	library_ID	price	late_return_fine
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There are 3 FDs. $(\text{book_ID}, \text{copy_ID}) \rightarrow \text{library_ID}$. $(\text{book_ID}, \text{copy_ID}) \rightarrow \text{price}$. $(\text{book_ID}, \text{copy_ID}) \rightarrow \text{late_return_fine}$.

$(\text{book_ID}, \text{copy_ID})$ is the primary key and a super key, making the table BCNF.

$(\text{book_ID}, \text{copy_ID})$ pinpoints the exact copy of a specific book.

Library

library_ID	library_name	address	zipcode
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There are 3 FDs. $\text{library_ID} \rightarrow \text{library_name}$. $\text{library_ID} \rightarrow \text{address}$. $\text{library_ID} \rightarrow \text{zipcode}$.

library_ID is the primary key and a super key, making the table BCNF.

Note that library_name can change, so we did not use it as a primary key. There is not a FD from address toward zipcode as our address in this table only has one line without the state and city.

We used to have state and city listed in the table as well. However, this brought up the problem of zipcode having FDs pointing toward both state and city. We decided to remove the two, considering the project is revolving around UR and everything will just be Rochester, NY anyway. Our assumption is that all the libraries will be located in Rochester NY.

Borrower

borrower_name	ssn	birthday	email	phone
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There are 4 FDs. $ssn \rightarrow borrower_name$. $ssn \rightarrow birthday$. $ssn \rightarrow email$. $ssn \rightarrow phone$.

ssn is the primary key and a super key, making the table BCNF.

ssn serves as the unique identification in this table as two person will never have the same ssn.

Loan record

record_ID	book_ID	copy_ID	library_ID	ssn	borrowed_date	due_date	return_date
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There are 6 FDs. $record_ID \rightarrow (book_ID, copy_ID)$ $record_ID \rightarrow library_ID$. $record_ID \rightarrow ssn$. $record_ID \rightarrow borrowed_date$. $record_ID \rightarrow due_date$. $record_ID \rightarrow return_date$.

record_ID is the primary key and a super key, making the table BCNF.

record_ID is incremental and there will be a new entry for every new book rental.