Task 1: Normalization of relational schemas

SCHEMA #1:
BOOK(call-number, ISBN, title, publisher)
primary key = (call-number)
Functional Dependencies:
call-number→ ISBN, title, publisher
ISBN → title, publisher

Minimal keys:
Call-number

Current normal form:
1NF: ISBN → title, publisher
-A non-prime is not fully dependent on a primary key

Convert to BCNF:
-decompose into two separate schemas for each functional dependency
Ie.
BOOKS(ISBN, title, publisher) primary key = ISBN
ISBN → title, publisher (schema 1)

LIBRARY_BOOKS(call-number, ISBN) primary key = call-number
Call-number → ISBN (schema 2)
-now in BCNF as LHS is superkey for all functional dependencies in each schema

SCHEMA #2: STUDENT(student-number, first-name,last-name)
primary key = (student-number)
Functional Dependencies:
Student-number → first-name, last-name
Minimal keys:
student-number
Current normal form:
-BCNF because LHS is superkey for all functional dependencies
Convert to BCNF:
-unnecessary because already in BCNF

SCHEMA #3: BORROW(call-number, ISBN, student-number, borrow-date)
primary key = (call-number, student-number)
Functional Dependencies:
Call-number, student-number→ ISBN, borrow-date
call-number→ ISBN

Minimal keys:
Call-number, student-number

Current normal form:
1NF as non-prime is partially dependent on a primary key. (Call-number → ISBN)

Convert to BCNF:
-decompose into two schemas:
BORROW(call-number, student-number, borrow-date)
primary key = (call-number, student-number)
Foreign key = call-number references BOOKS
call-number, student-number→ borrow-date (schema 1)

BOOKS(call-number, ISBN) primary key = call-number
call-number→ ISBN (schema 2)