Assignment 8

BCNF Verification

The functional dependencies(→)

student
student_id → email_address, student_name, phone_number

Since **student_id** is the primary key and thus a candidate key, this table satisfies BCNF

- There are no partial or transitive dependencies, as each non-key attribute fully depends on the candidate key student_id.
- This table satisfies 3NF and BCNF because all non-key attributes are fully dependent on student_id (the candidate key and superkey).

Step1: we listed all the attributes and FD's
Step2: reduced the list of FD's, but in this case we didn't have many. Then we got a list of minimum FD's
Step3: identified the key's (left hand side)
Step4: we derived the final schema which was lossless and preserved all the other dependencies

librarybranch
branch_id → branch_name, contact_number, city, street_address

Since **branch_id** is the primary key and thus a candidate key, this table satisfies BCNF

- There are no partial or transitive dependencies, as each non-key attribute fully depends on the candidate key student_id.
- This table satisfies 3NF and BCNF because all non-key attributes are fully dependent on branch_id (the candidate key and superkey).

Step1: we listed all the attributes and FD's
Step2: reduced the list of FD's, but in this case we only had one (city and postal code). Then we got a list of minimum FD's
Step3: identified the key's (left hand side)
Step4: we derived the final schema which was lossless and preserved all the other dependencies (removing the postal code didn't change anything in our database)

university_admin
admin_id → email_address, admin_name, phone_number, branch_id

Since **admin_id** is the primary key and thus a candidate key, this table satisfies BCNF

- There are no partial or transitive dependencies, as each non-key attribute fully depends on the candidate key student_id.
- This table satisfies 3NF and BCNF because all non-key attributes are fully dependent on admin_id (the candidate key and superkey).

Step1: we listed all the attributes and FD's
Step2: reduced the list of FD's, but in this case we didn't have many. Then we got a list of minimum FD's
Step3: identified the key's (left hand side)
Step4: we derived the final schema which was lossless and preserved all the other dependencies

author
author_id → author_name

Since **author_id** is the primary key and thus a candidate key, this table satisfies BCNF

- There are no partial or transitive dependencies, as each non-key attribute fully depends on the candidate key student_id.
- This table satisfies 3NF and BCNF because all non-key attributes are fully dependent on author_id (the candidate key and superkey).

Step1: we listed all the attributes and FD's
Step2: reduced the list of FD's, but in this case we didn't have many. Then we got a list of minimum FD's
Step3: identified the key's (left hand side)
Step4: we derived the final schema which was lossless and preserved all the other dependencies

book
ISBN → book_title, author_id, publication_year, genre

Since **ISBN** is the primary key and does not have partial dependencies, this table satisfies BCNF

- There are no partial or transitive dependencies, as each non-key attribute fully depends on the candidate key student_id.
- This table satisfies 3NF and BCNF because all non-key attributes are fully dependent on ISBN (the candidate key and superkey).

Step1: we listed all the attributes and FD's

Step2: reduced the list of FD's, but in this case we didn't have many. Then we got a list of minimum FD's
Step3: identified the key's (left hand side)
Step4: we derived the final schema which was lossless and preserved all the other dependencies

can_contain
{ISBN, branch_id} → (for can_contain)

Since **ISBN, branch_id** are combined primary key and does not have any additional attribute, this table satisfies BCNF

- There are no partial or transitive dependencies, as each non-key attribute fully depends on the candidate key(combined primary key) ISBN, branch_id.
- This table satisfies 3NF and BCNF because all non-key attributes are fully dependent on ISBN, branch_id (the candidate key and superkey).

Step1: we listed all the attributes and FD's
Step2: reduced the list of FD's, but in this case we didn't have many. Then we got a list of minimum FD's
Step3: identified the key's (left hand side)
Step4: we derived the final schema which was lossless and preserved all the other dependencies

published
{author_id, ISBN} → (for published)

Since **ISBN, author_id** are combined primary key and does not have any additional attribute, this table satisfies BCNF

- There are no partial or transitive dependencies, as each non-key attribute fully depends on the candidate key(combined primary key) author_id, ISBN.
- This table satisfies 3NF and BCNF because all non-key attributes are fully dependent on author_id, ISBN (the candidate key and superkey).

Step1: we listed all the attributes and FD's
Step2: reduced the list of FD's, but in this case we didn't have many. Then we got a list of minimum FD's
Step3: identified the key's (left hand side)
Step4: we derived the final schema which was lossless and preserved all the other dependencies

part_of
{student_id, branch_id} → (for part_of)

Since **student_id, branch_id** are combined primary key and does not have any additional attribute, this table satisfies BCNF

- There are no partial or transitive dependencies, as each non-key attribute fully depends on the candidate key(combined primary key) student_id, branch_id.
- This table satisfies 3NF and BCNF because all non-key attributes are fully dependent on student_id, branch_id (the candidate key and superkey).

Step1: we listed all the attributes and FD's
Step2: reduced the list of FD's, but in this case we didn't have many. Then we got a list of minimum FD's
Step3: identified the key's (left hand side)
Step4: we derived the final schema which was lossless and preserved all the other dependencies

book_fine
fine_id → student_id, status, amount, reason, fine_date

Since **fine_id** is the primary key and thus a candidate key, this table satisfies BCNF

- There are no partial or transitive dependencies, as each non-key attribute fully depends on the candidate key fine_id.
- This table satisfies 3NF and BCNF because all non-key attributes are fully dependent on fine_id (the candidate key and superkey).

Step1: we listed all the attributes and FD's
Step2: reduced the list of FD's, but in this case we didn't have many. Then we got a list of minimum FD's
Step3: identified the key's (left hand side)
Step4: we derived the final schema which was lossless and preserved all the other dependencies

loan
loan_id → student_id, ISBN, loan_date

Since **loan_id** is the primary key, this table satisfies BCNF

- There are no partial or transitive dependencies, as each non-key attribute fully depends on the candidate key loan_id.

- This table satisfies 3NF and BCNF because all non-key attributes are fully dependent on loan (the candidate key and superkey).

Step1: we listed all the attributes and FD's
Step2: reduced the list of FD's, but in this case we didn't have many. Then we got a list of minimum FD's
Step3: identified the key's (left hand side)
Step4: we derived the final schema which was lossless and preserved all the other dependencies