Assignment 1 – Logical: Normalisation of Two Forms

Team: G067

Applied Class: Wednesdays 4pm-6pm   Unit: FIT3171 – Databases

Team Members: Jason Abi Chebli (31444059) and Keng Hong Low (34280014)

Table of Contents

Form 1: ReadMore Community Library Catalogue Search Output

Call No:	005.74 C822D 2023
Title:	Database systems : design, implementation, and management
Authors	• **ID:** 2036 **Name:** Coronel, Carlos • **ID:** 4809 **Name:** Morris, Steven
Subjects:	• **ID:** 1045 **Description:** Database design • **ID:** 1044 **Description:** Database management • **ID:** 1040 **Description:** Databases
Contents:	Part I: Database Concepts-- 1. Database Systems -- 2. Data Models -- Part II: Design Concepts-- 3. The Relational Database Model -- 4. Entity Relationship (ER) Modeling -- 5. Advanced Data Modeling -- 6. Normalization of Database Tables -- Part III: Advanced Design and Implementation -- 7. Introduction to Structured Query Language (SQL) -- 8. Advanced SQL -- 9. Database Design -- Part IV: Advanced Database Concepts -- 10. Transaction Management and Concurrency Control -- 11. Database Performance Tuning and Query Optimization -- 12. Distributed Database Management Systems -- 13. Business Intelligence and Data Warehouses -- 14. Big Data Analytics and NoSQL -- Part V: Databases and the Internet -- 15. Database Connectivity and Web Technologies -- Part VI: Database Administration -- 16. Database Administration and Security.
Publisher:	**ID:** 1230 **Name:** Cengage Learning
Date Published:	2023
Edition	14th Edition
No pages:	816
Language:	English
Note:	Includes bibliographical references and index.
Identifiers:	• **ISBN:** 9780357673034 **Type:** Hardcover • **ISBN:** 9780357673072 **Type:** Loose Leaf

Call No:	820.914 A211 A6/H 2002
Title:	The ultimate hitchhiker's guide to the galaxy
Authors:	• **ID:** 0231 **Name:** Adams, Douglas
Subjects:	• **ID:** 7321 **Description:** Science Fiction • **ID:** 7519 **Description:** Prefect, Ford (Fictitious character) • **ID:** 7520 **Description:** Dent, Arthur (Fictitious character)
Contents:	The hitchhiker's guide to the galaxy -- The restaurant at the end of the universe -- Life, the universe, and everything -- So long, and thanks for all the fish -- Young Zaphod plays it safe -- Mostly harmless.
Publisher:	**ID:** 0067 **Name:** Del Rey Books
Date Published:	2002
Edition	
No pages:	832
Language:	English
Note:	
Identifiers:	• **ISBN:** 9780345453747 **Type:** Paperback

UNF

CATALOGUE (catalogue_call_no, catalogue_title, (author_id, author_fname, author_lname), (subject_id, subject_desc), catalogue_contents, publisher_id, publisher_name, catalogue_publish_year, catalogue_edition, catalogue_page_no, catalogue_language, catalogue_note, (identifer_ISBN, identifier_book_type))

Repeating Groups:

- author_id, author_fname, author_lname
- subject_id, subject_desc
- identifer_ISBN, identifier_book_type

1NF

CATALOGUE (<u>catalogue_call_no</u>, catalogue_title, catalogue_contents, publisher_id, publisher_name, catalogue_publish_year, catalogue_edition, catalogue_page_no, catalogue_language, catalogue_note)

Candidate Keys:

- catalogue_call_no

CATALOGUE_AUTHOR (<u>catalogue_call_no</u>, <u>author_id</u>, author_fname, author_lname)

Candidate Keys:

- catalogue_call_no, author_id

CATALOGUE_SUBJECT (<u>catalogue_call_no</u>, <u>subject_id</u>, subject_desc)

<u>Candidate Keys:</u>

- catalogue_call_no, subject_id

IDENTIFIER (<u>identifer_ISBN</u>, identifier_book_type, catalogue_call_no)

<u>Candidate Keys:</u>

- identifier_ISBN

Partial Dependencies:

- author_id → author_fname, author_lname
- subject_id → subject_desc

2NF

CATALOGUE (<u>catalogue_call_no</u>, catalogue_title, catalogue_contents, publisher_id, publisher_name, catalogue_publish_year, catalogue_edition, catalogue_page_no, catalogue_language, catalogue_note)

CATALOGUE_AUTHOR (<u>catalogue_call_no</u>, <u>author_id</u>)

AUTHOR (<u>author_id</u>, author_fname, author_lname)

CATALOGUE_SUBJECT (<u>catalogue_call_no</u>, <u>subject_id</u>)

SUBJECT (<u>subject_id</u>, subject_desc)

IDENTIFIER (<u>identifer_ISBN</u>, identifier_book_type, catalogue_call_no)

Note for AUTHOR and SUBJECT, there is only one candidate key, author_id and subject_id respectively, for each of them which, therefore, becomes the primary key.

Transitive Dependencies:

- publisher_id → publisher_name

3NF

CATALOGUE (catalogue_call_no, catalogue_title, catalogue_contents, publisher_id, catalogue_publish_year, catalogue_edition, catalogue_page_no, catalogue_language, catalogue_note)

PUBLISHER (publisher_id, publisher_name)

CATALOGUE_AUTHOR (catalogue_call_no, author_id)

AUTHOR (author_id, author_fname, author_lname)

CATALOGUE_SUBJECT (catalogue_call_no, subject_id)

SUBJECT (subject_id, subject_desc)

IDENTIFIER (identifer_ISBN, identifier_book_type, catalogue_call_no)

Note for PUBLISHER, there is only one candidate key, publisher_id, which, therefore, becomes the primary key.

Full Dependencies:

- catalogue_call_no → (catalogue_title, catalogue_contents, publisher_id, catalogue_publish_year, catalogue_edition, catalogue_page_no, catalogue_language, catalogue_note)
- publisher_id → publisher_name
- author_id → (author_fname, author_lname)
- subject_id → subject_desc
- identifer_ISBN → identifier_book_type, catalogue_call_no

Form 2: ReadMore Community Library Borrowers Quarterly Report

QUARTERLY BORROWER LOAN REPORT

| Borrower No | 1234 | | | | Report Date: | 30 Jun 2024 |

Borrower

First Name:	Mary
Last Name:	Greenwood
Borrower Class	Adult
Borrowing Status	Permitted ☐
	Banned ☑

Branch Code	Book Copy ID	Branch Name	Borrowed	Due Back	Returned	Fine Amnt	Date Fine Paid
100	2373	Clayton Central	02 Apr 2024 09:10	09 Apr 2024	07 Apr 2024 09:15		
100	4455	Clayton Central	15 Apr 2024 14:00	18 Apr 2024	20 Apr 2024 12:34	$4	20 Apr 2024
100	4901	Clayton Central	28 Apr 2024 10:00	4 May 2024	4 May 2024 10:21		
100	4455	Clayton Central	28 Apr 2024 11:10	4 May 2024	4 May 2024 11:06		
100	4216	Clayton Central	28 Apr 2024 10:15	4 May 2024	4 May 2024 10.09		
100	7536	Clayton Central	4 May 2024 10:00	11 May 2024	11 May 2024 10:20		
100	2373	Clayton Central	4 May 2024 12:30	11 May 2024	11 May 2024 09:10		
102	0372	West Riding	11 May 2024 13:00	18 May 2024	11 May 2024 09:16		
102	4455	West Riding	11 May 2024 13:05	18 May 2024	18 May 2024 12:15		
... multiple rows omitted ...							
100	0876	Clayton Central	15 Jun 2024 13:15	16 Jun 2024	16 Jun 2024 16:10		
102	2354	West Riding	20 Jun 2024 16:00	27 Jun 2024			

Note overdue loans are flagged in this report with:

UNF

BORROWER (borrower_no, borrower_fname, borrower_lname, class_type, borrower_status, (branch_code, book_copy_id, branch_name, loan_datetime, loan_due_date, loan_return_datetime, loan_fine_amount, loan_fine_date_paid))

Note: the attribute 'class_type' refers to 'Borrower Class' in the form.

Repeating Groups:

- branch_code, book_copy_id, branch_name, loan_datetime, loan_due_date, loan_return_datetime, loan_fine_amount, loan_fine_date_paid

1NF

BORROWER (<u>borrower_no</u>, borrower_fname, borrower_lname, borrower_status, class_type)

Candidate Keys:

- borrower_no

LOAN (<u>branch_code</u>, <u>book_copy_id</u>, <u>loan_datetime</u>, branch_name, loan_due_date, loan_return_datetime, loan_fine_amount, loan_fine_date_paid, borrower_no)

<u>Candidate Keys:</u>

- branch_code, book_copy_id, loan_datetime

Partial Dependencies:

- branch_code → branch_name

2NF

BORROWER (<u>borrower_no</u>, borrower_fname, borrower_lname, borrower_status, class_type)

LOAN (<u>branch_code</u>, <u>book_copy_id</u>, <u>loan_datetime</u>, loan_due_date, loan_return_datetime, loan_fine_amount, loan_fine_date_paid, borrower_no)

BRANCH (<u>branch_code</u>, branch_name)

<u>Candidate Keys:</u>

- branch_code

Transitive Dependencies:

- There are no transitive dependencies present, therefore, 2NF = 3NF

3NF

BORROWER (<u>borrower_no</u>, borrower_fname, borrower_lname, borrower_status, class_type)

LOAN (<u>branch_code</u>, <u>book_copy_id</u>, <u>loan_datetime</u>, loan_due_date, loan_return_datetime, loan_fine_amount, loan_fine_date_paid, borrower_no)

BRANCH (<u>branch_code</u>, branch_name)

Full Dependencies:

- borrower_no → (borrower_fname, borrower_lname, borrower_status, class_type)
- (branch_code, book_copy_id, loan_datetime) → (loan_due_date, loan_return_datetime, loan_fine_amount, loan_fine_date_paid, borrower_no)
- branch_code → branch_name

Consolidation of the Two Forms

Collected 3NF Relations

1. CATALOGUE (<u>catalogue_call_no</u>, catalogue_title, catalogue_contents, publisher_id, catalogue_publish_year, catalogue_edition, catalogue_page_no, catalogue_language, catalogue_note)
2. PUBLISHER (<u>publisher_id</u>, publisher_name)
3. CATALOGUE_AUTHOR (<u>catalogue_call_no</u>, <u>author_id</u>)
4. AUTHOR (<u>author_id</u>, author_fname, author_lname)
5. CATALOGUE_SUBJECT (<u>catalogue_call_no</u>, <u>subject_id</u>)
6. SUBJECT (<u>subject_id</u>, subject_desc)
7. IDENTIFIER (<u>identifer_ISBN</u>, identifier_book_type, catalogue_call_no)
8. BORROWER (<u>borrower_no</u>, borrower_fname, borrower_lname, borrower_status, class_type)
9. LOAN (<u>branch_code</u>, <u>book_copy_id</u>, <u>loan_datetime</u>, loan_due_date, loan_return_datetime, loan_fine_amount, loan_fine_date_paid, borrower_no)
10. BRANCH (<u>branch_code</u>, branch_name)

Attribute Synthesis

- All of the relations are unique and are, therefore, cannot be further sythesised. Hence, they are in their final form.

Final 3NF Relations

CATALOGUE (<u>catalogue_call_no</u>, catalogue_title, catalogue_contents, publisher_id, catalogue_publish_year, catalogue_edition, catalogue_page_no, catalogue_language, catalogue_note)

PUBLISHER (<u>publisher_id</u>, publisher_name)

CATALOGUE_AUTHOR (<u>catalogue_call_no</u>, <u>author_id</u>)

AUTHOR (<u>author_id</u>, author_fname, author_lname)

CATALOGUE_SUBJECT (<u>catalogue_call_no</u>, <u>subject_id</u>)

SUBJECT (<u>subject_id</u>, subject_desc)

IDENTIFIER (<u>identifer_ISBN</u>, identifier_book_type, catalogue_call_no)

BORROWER (<u>borrower_no</u>, borrower_fname, borrower_lname, borrower_status, class_type)

LOAN (<u>branch_code</u>, <u>book_copy_id</u>, <u>loan_datetime</u>, loan_due_date, loan_return_datetime, loan_fine_amount, loan_fine_date_paid, borrower_no)

BRANCH (<u>branch_code</u>, branch_name)