

## Prac #4

### Exercises on Normalisation Process

#### Note:

Most exercise tasks included in this prac does not require to use MySQL Workbench. You can put your answer directly on the paper or WORD document for those tasks.

Some tasks requiring to draw the final normalised ERD, you will have to use MySQL Workbench.

- **Pre-requisites**

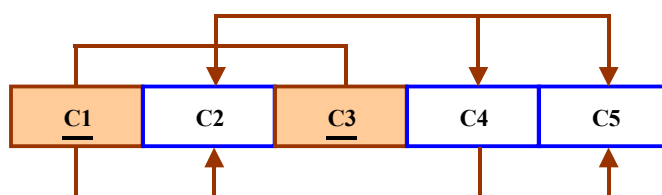
In order to complete exercises in this prac, you are assumed the knowledge of normalisation principles and procedures which was covered through recent lectures and relevant reading materials (Chapter 6 from Coronel-Morris textbook).

This Prac consists of three Exercises: Pre-Exercise, Exercise 1 and Exercise 2. Pre-Exercise is pre-knowledge required to work on Exercise 1. Exercise 2 is an advanced practice which is optional to complete.

#### [Pre-Exercise]

This is just for your practice purpose only, therefore the sample solutions are provided for your study.

Given the dependency diagram shown below, answer items a to c:



a. Identify and discuss each of the indicated dependencies.

#### Sample Answers:

- $(C1 \rightarrow C2)$  represents a *partial dependency*, because C2 depends only on C1, rather than on the entire primary key composed of C1 and C3.
- $(C4 \rightarrow C5)$  represents a *transitive dependency*, because C5 depends on an attribute (C4) that is not part of a primary key.
- $(C1, C3 \rightarrow C2, C4, C5)$  represents a set of proper functional dependencies, because C2, C4, and C5 depend on the primary key composed of C1 and C3.

- b. Create a database whose tables are at least in 2NF, showing the dependency diagrams for each table.

**Sample Answers:**

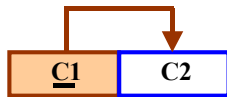


Table 1

Primary key: C1  
Foreign key: None  
Normal form: 3NF

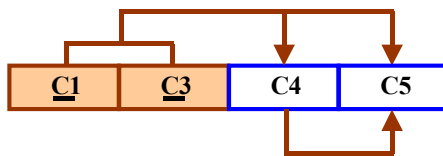


Table 2

Primary key: C1 + C3  
Foreign key: C1 (to Table 1)  
Normal form: 2NF, because the table exhibits the transitive dependencies  $C4 \rightarrow C5$

Instead of presenting these databases and relevant dependencies using graphical charts as shown above, you can simply present these using schema texts:

- Table 1 ( $\underline{C1} \rightarrow C2$ )
- Table 2 ( $\underline{C1}, \underline{C3} \rightarrow C4, C5$ ) with transitive dependency ( $C4 \rightarrow C5$ ).

*Note: PK is presented using underline.*

- c. Create a database whose tables are at least in 3NF, showing the dependency diagrams for each table.

**Sample Answers:**

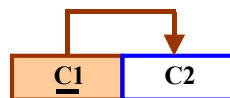


Table 1

Primary key: C1  
Foreign key: None  
Normal form: 3NF

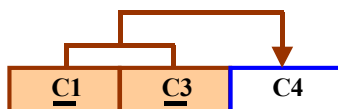


Table 2

Primary key: C1 + C3  
Foreign key: C1 (to Table 1)  
C4 (to Table 3)  
Normal form: 3NF

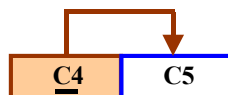


Table 3

Primary key: C4  
Foreign key: None  
Normal form: 3NF

**Alternative presentation of this answers:**

- Table 1 ( $\underline{C1} \rightarrow C2$ )
- Table 2 ( $\underline{C1}, \underline{C3} \rightarrow C4$ )
- Table 3 ( $C4 \rightarrow C5$ ).

### [Exercise 1]

Using the STUDENT table structure shown in the table below, do the following (a to c):

Sample STUDENT Records

Attribute Name	Sample Value	Sample Value	Sample Value	Sample Value	Sample Value
STU_NUM	211343	200128	199876	199877	223456
STU_LNAME	Stephanos	Smith	Jones	Smith	McKulski
STU_MAJOR	Accounting	MBA	Marketing	Marketing	Statistics
DEPT_CODE	ACCT	ACCT	MKTG	MKTG	MATH
DEPT_NAME	Accounting	Accounting	Marketing	Marketing	Mathematics
DEPT_PHONE (representative number)	4356	4356	4378	4378	3420
COLLEGE_NAME	Business Admin	Business Admin	Business Admin	Business Admin	Arts & Sciences
ADVISOR_ID	1001	1442	1442	1799	1902
ADVISOR_LNAME	Grastrand	Gentry	Gentry	Tillery	Chen
ADVISOR_OFFICE	T201	T201	T201	T356	J331
ADVISOR_BLDG	Torre Building	Torre Building	Torre Building	Torre Building	Jones Building
ADVISOR_PHONE	2123	2123	2123	2159	3209
STU_GPA	3.87	2.78	2.31	3.45	3.58
STU_HOURS	75	45	117	113	87
STU_CLASS	Junior	Sophomore	Senior	Senior	Junior

(Put your answers for task a and b in a WORD document. For c, you are required to draw the ERD using MySQL Workbench)

- Draw its dependency diagram and identify all dependencies, including all transitive dependencies.
- Write the relational schema and draw the dependency diagram to meet the 3NF requirements to the greatest extent possible. If you believe that practical considerations dictate using a 2NF structure, explain why your decision to retain 2NF is appropriate. If necessary, add or modify attributes to create appropriate determinants and to adhere to the naming conventions.
- Draw the Crow's Foot ERD.

## [Exercise 2 (additional exercise for advanced task)]

This is just for your practice for advanced level of normalisation. The solution is not provided directly here but will be available later. If you want to try this advanced task, please try it yourself!

The manager of a consulting firm has asked you to evaluate a database that contains the table structure shown below.

Sample CLIENT Records

Attribute Name	Sample Value	Sample value	Sample Value
CLIENT_NUM	298	289	289
CLIENT_NAME	Marianne R. Brown	James D. Smith	James D. Smith
CLIENT_REGION	Midwest	Southeast	Southeast
CONTRACT_DATE	10-Feb-2010	15-Feb-2010	12-Mar-2010
CONTRACT_NUMBER	5841	5842	5843
CONTRACT_AMOUNT	\$2,985,00.00	\$670,300.00	\$1,250,000.00
CONSULT_CLASS_1	Database Administration	Internet Services	Database Design
CONSULT_CLASS_2	Web Applications		Database Administration
CONSULT_CLASS_3			Network Installation
CONSULT_CLASS_4			
CONSULTANT_NUM_1	29	34	25
CONSULTANT_NAME_1	Rachel G. Carson	Gerald K. Ricardo	Angela M. Jamison
CONSULTANT_REGION_1	Midwest	Southeast	Southeast
CONSULTANT_NUM_2	56	38	34
CONSULTANT_NAME_2	Karl M. Spenser	Anne T. Dimarco	Gerald K. Ricardo
CONSULTANT_REGION_2	Midwest	Southeast	Southeast
CONSULTANT_NUM_3	22	45	
CONSULTANT_NAME_3	Julian H. Donatello	Geraldo J. Rivera	
CONSULTANT_REGION_3	Midwest	Southeast	

This table was created to enable the manager to match clients with consultants. The objective is to match a client within a given region with a consultant in that region, and to make sure that the client's need for specific consulting services is properly matched to the consultant's expertise. For example, if the client need help with database design and is located in the Southeast, the objective is to make a match with a consultant who is located in the Southeast and whose expertise is in database design. (Although the consulting company manage tries to match consultant and client locations to minimize travel expense, it is not always possible to do so.) The following basic business rules are maintained:

- Each client is located in one region
- A region can contain many clients.
- Each consultant can work on many contracts
- Each contract might require the services of many consultants.

- A client can sign more than one contract, but each contract is signed by only one client.
  - Each contract might cover multiple consulting classifications. (For example, a contract may list consulting services in database and networking.)
  - Each consultant is located in one region.
  - A region can contain many consultants.
  - Each consultant has one or more areas of expertise (class). For example, a consultant might be classified as an expert in both database design and networking.
  - Each area of expertise (class) can have many consultants in it. For example, the consulting company might employ many consultants who are networking experts.
- a. Given that brief description of the requirements and the business rules, write the relational schema and draw the dependency diagram for the preceding (and very poor) table structure. Label all transitive and/or partial dependencies.
  - b. Break up the dependency diagram you drew in the previous problem segment (a) to produce dependency diagrams that are in 3NF. (*Hint*: You might have to create a few new attributes. Also make sure that the new dependency diagrams contain attributes that meet proper design criteria; that is, make sure that there are no multivalued attributes, that the naming conventions are met, and so on.)
  - c. Using the results of the previous problem segment (b), draw the Crow's Foot ERD.

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This is the end of Prac #4.

You are only required to submit [Exercise 1] in one WORD document containing your answers and the image of ERD created in MySQL Workbench. (Alternatively, you can submit the original Workbench file having the ERD).

[Exercise 2] is not required to submit. It is just for your own practice.

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**Marking Criteria:**

(This prac weighs 3% of the total subject marks)

**You will be given 0 to 3 marks depending on your completeness/correctness of your work.**