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COS 221 Practical Assignment 2

- Date Issued: **8 March 2023**
- Date Due: **22 March 2023** before **11:00 (in the morning)**
- Submission Procedure: **Upload to ClickUP**
- This assignment consists of **8 tasks** for a total of **70 marks**.

1 Introduction

You have graduated from Computer Science at the University of Pretoria and you are hired by the First National Bank in South Africa. The bank would like to launch a new product designed for students and attract them to use it because it is cheap and provides a better service between the students, the bank staff, and the parents. Your new employer has requested that you design the conceptual data model for the system. The system must allow users to capture the client's information. All the clients are identified by a unique number only allocated to them. When registering new clients, they are required to provide names, age, sex, address, and contact details. For security reasons and monitoring, the new bank system asks the clients to update their ID numbers and provide proof of address every year. For proximity reasons, FNB provides several branches in South Africa. This will allow a parent who would like to deposit money into his child's account to easily do so. The account can be a cheque account, a savings account, or the money can be transferred directly to an ATM by making an electronic transfer. A student can also receive money from outside South Africa via forex. To open a bank account, a client must go to one of the FNB branches which are identified by a unique branch code. The FNB system will use more information related to branches such as an address, open and closing days and times, and contact details. Each branch will be responsible for administering various ATMs across South Africa. The bank would like to always know how much cash is available at each ATM as well as the date and time of the last filling of the ATM. FNB has contracts with multiple Cash-In-Transit (CIT) companies responsible for filling up the ATM. For each of these contracts, it is required to store the start and end date of the contract. To ensure cash is always available, an ATM is allowed to be filled up by various CIT contracts.

After successful completion of this assignment you should be able to:

- identify entities from a given description;
- determine attributes for each of the entities from the description using the set notation;
- identify relationships between the entities along with their respective cardinalities and participations;
- translate what you have determined and identifies into a conceptual model using Chen's notation; and
- draw the corresponding (E)ER-diagram.
- translate the (E)ER-diagram to the relational model.

2 Constraints

1. You must complete this assignment individually or in pairs.
2. You may ask the Teaching Assistants for help but they will not be able to give you the solutions.
3. This is a *paper and pen* exercise and therefore you will need to find a tool to help you to draw the (E)ER-diagram and the relational model.

3 Submission Instructions

You are required to upload a single PDF that includes the answers to all the task. Make sure you upload your PDF to ClickUP in good time. No late submissions will be accepted, so make sure you upload in good time.

4 Online resources

The following resources will help with creating a conceptual model using Chen's Notation.

Visual Paradigm Online: `http://online.visual-paradigm.com`

draw.io: `http://diagrams.net`

5 Rubric for marking

Identify the Entites	7
Identify the Attributes	7
Expand Complex Attributes	7
Identify Derived Attributes	2
NULL values	2
Conceptual Model Review	
Sharia-compliant	2
Introduction of USD$	2
Provision for handles	2
Client registration requirements	2
Final (E)ER-diagram	
Entities	4
Attributes	4
Relationships	
- participation	2
- cardinality	2
Mapping to relational model	
Each step is shown and discussed	18
Appropriate data type proposed	7
Total	**70**

6 Assignment Instructions

Task 1: Identify the Entities ..... (7 marks)

Identify the various entities from the provided text.

Task 2: Identify the Attributes ..... (7 marks)

For each of the previously identified entities, identify all attributes for **EACH** entity. Note: You may advise the client if you believe that certain attributes are lacking from the provided brief. Provide the entity name and attributes using the set notation: ENTITY_NAME(Attribute1, ... , Composite_Attribute(CA1, ..., CAm), {MV1, ... , MVp})

Task 3: Expand Complex Attributes ..... (7 marks)

For each of the previously identified attributes, expand all complex attributes.

Task 4: Identify Derived Attributes ..... (2 marks)

For each of the previously identified attributes, list which attributes are derived and provide the entity to which they belong.

Task 5: NULL Values ..... (2 marks)

Does your conceptual design require the use of NULL values for certain attributes. If so, list and explain why the identified attributes would require NULL values.

Task 6: Conceptual Data Model Review ..... (8 marks)

After you designed your conceptual model, you present your model the FNB Chief executive officer.

6.1 Does your conceptual model allow for the introduction of a Sharia-compliant 32-day savings account in future? **Explain** why it does, or how your model would need to be amended to allow for these requirements. (2)

6.2 Does your conceptual model allow for the introduction of a USD$ (United States of American Dollar) denominated account? **Explain** why it does, or how your model would need to be amended to allow for these requirements. (2)

6.3 In the future the bank would like to add additional contact methods such as an Instagram handle, Facebook handle or Session Initiation Protocol Uniform Resource Identifier (SIP URI) to allow them to contact the user over VOIP (`https://en.wikipedia.org/wiki/SIP_URI_scheme`). Does your conceptual model cater for these additional contact methods. **Explain** why it does, or how your model would need to be amended to allow for these requirements. (2)

6.4 Would you think of another requirement for the bank to verify other types of information about a client, e.g. telephone number, email address, Instagram handle? Does your conceptual model cater for these additional validation types. **Explain** why it does, or how your model would need to be amended to allow for these requirements. (2)

Task 7: Final (E)ER-diagram ..... (12 marks)

Draw the final (E)ER-diagram of your conceptual model that takes all the previous tasks into account.

Task 8: Mapping to Relational model ..... (25 marks)

Using the algorithm given in Chapter 9 of the textbook, map your conceptual model onto the relational model. For each attribute in the relational model, propose a data type.

IMPORTANT NOTE: Please refer to the rubric for the detailed allocation of marks.