Database assignments guide

Besides the notes provided in the assignment report, here is additional information to assist you in writing a comprehensive report.

Important: This guide is intended to help you understand the assignment and how to appropriately answer each section. Do not submit your documents with these notes included and avoid using them as headlines in your answers. Again, this is a guide meant solely for your assistance.

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Technical Documentation

1 Introduction

You should describe, in approximately two paragraphs, the system you will be documenting. Detail the purpose and benefits of this technical documentation, as well as the information it contains. It is recommended to write this initial description and review it after completing the document. In this document, …

2 Database Requirement

2.1 User and System Requirement

In this part, you need to focus on both user and system requirements separately.

- For user requirements, list each possible user for your system and the services they can perform on the system (as bullet points)
- For system requirements, describe what the system should achieve, such as ease of use and user-friendliness.

2.2 Data Requirements

- The data requirements section should be similar to the scenarios mentioned in our material slides (e.g., company example and bank example); **check slide 25 in In**

slides of Logical Model - Part 1 (Mapping). However, here we ask you to present this information as separate points instead of paragraphs.

- Avoid using the terms "entities," "relationships," or "attributes" explicitly.
- Make sure that your scenario include examples of composite attributes, multi-value attributes, and various relationships types (1:1, 1:M, and M:N) . ○ Make sure you will have 4 entities before mapping.

3 Database Design

3.1 Conceptual Design

You need to define what is the conceptual design, its goal, and its components. Then add the figure of the Conceptual design. Also, give a brief description of the figure.

3.2 Schema and Mapping

You need to do mapping and show it step by step **(do it like slides)** on each step you need to show the schema before and after modification and you need to mark PK/FK

3.3 Logical Design

You need to define what is the logical design, its goal, and its components. Then add the figure of the Logical design. Also, give a brief description of the figure.

3.4 Physical Design

You need to define what is the Physical design, its goal, and its components. Then add the figure of the Physical design. Also, give a brief description of the figure.

3.5 Effectiveness of the design

1. This section requires you to explain each step you took during the database design process. **For each step, provide detailed reasoning and use your data example. Avoid general answers.** Here are the points you need to cover:

   - Justify why you selected specific entities to present your system and why you chose particular attributes.
   - Explain the reasons behind implementing 1:1, 1:m, and m:n relationships in your design.
   - Describe why you created the conceptual design and its target audience.
   - Explain the importance of creating the schema and its significance.
   - Clarify what information you added to the logical design and its intended purpose.
   - Discuss what information you added to the physical design and why it was necessary. **Mention examples from your data in your explanation.**
   - Explain the reasons for applying normalization, detailing each normalization form you implemented and why. **Mention examples from your data in your explanation.**
   - In conclusion, add a paragraph about how the culmination of all the previous steps in the database design process aims to achieve the ultimate goal of meeting both user and system requirements seamlessly.

   Please avoid using the exact bullet points in your answer. This is only a clarification for you to understand what the answer should include. Instead of using bullet points, provide explanations in paragraph form. Ensure that all your answers are based on your design and avoid general information. (I expect at least 1 page)

4 Normalization

refer to the **"ViolateNormalizationExamples.pdf**. In this section, **you should apply normalization techniques to the relations in your schema, not using external examples.**

You need to provide **2 examples at least for each Normal Form.**

4.1 1st NF

Relations	Attributes	Violation description	Solution – Relations
The relations schema	The attribute name	Describe why it is not in the 1st NF (the violation)	Show the schema for each affected relation.

4.2 2nd NF

Relations	FDs	Violation description	Solution – Relations
The relations schema	Show the functional dependencies causing the violation	Describe why it is not in the 2nd NF (the violation)	Show the schema for each affected relation.

4.3 3rd NF

Relations	FDs	Violation description	Solution – Relations
The relations schema	Show the functional dependencies causing the violation	Describe why it is not in the 3rd NF (the violation)	Show the schema for each affected relation.

5 Physical Schema

Add the physical schema using the Designer feature in workbench, NOT from draw.io.

You should export the design only after ensuring that all DDL changes (schema changes) have been finalized. The main components to display are the tables, complete with all attributes and data types, as well as the connecting lines representing the relationships. Showing views and procedures is optional.

6 Database Development

6.1 Database Overview

You should fill in all your tables, NOT just 4 of them. The description should be comprehensive and should include: The purpose of each table, Stored information such as attributes, types, and constraints, along with their rationale. Also, identify the Primary Key (PK) and, if there are any Foreign Keys (FKs), explain how they are connected to other tables and the reasons for these connections.

Table	Name	Description
1.		
2.		
3.		
4.		

You should complete all the views you have created; at least 4 views are required. The description should be comprehensive, including the aim of each view and how it's implemented, with explanations NOT the query command.

View	Name	Description
1.		
2.		
3.		
4.		

You should complete all the procedures you have created; at least 4 procedures are necessary. The description should be comprehensive, including the aim of each procedure and how it's implemented, with explanations NOT the query command.

Procedure	Name	Description
1.		
2.		
3.		
4.		

Important Note:

- You should fill tables meaningfully, i.e., by entering data logically:

- Populate tables created for multi-valued attributes with multiple values.
- Populate tables created due to 1:M relationships with data that demonstrate these relationships. o Populate tables created due to M:N relationships with data that proves these relationships.

- Create meaningful views and procedures, i.e., don't just apply the process of creating views/procedures, but rather focus on creating them for a logical purpose and for potential users who will benefit from them.

6.2 Security

- You should create a user for each role in your system, and these users should also exist in the SQL you submit. For each user, include:
- The username you used to create that user.
- **All** privilege commands you assigned to the user (not only 2), along with a description and a screenshot.
- Important Notice: You should keep the size of screenshots reasonably small; however, it is essential to ensure their resolution is high enough.

User name	Privilege Command	Description	Screenshot
Username Username	Query of given privilege (not screenshot)	Explain the privilege	Screenshot of the query executed successfully. Note: Make sure to take a screenshot that shows the query command alongside the results.
	Query of given privilege (not screenshot)	Explain the privilege	Screenshot of the query executed successfully. Note: Make sure to take a screenshot that shows the query command alongside the results.

6.3 User Interface

6.3.1 Flowchart and Data Movement Diagrams

- Flowchart for the system as Admin only - DFD for each user you created.

6.3.2 Interfaces Development

Using mysql.py tool, generate pages for one of the users in your system. Then, you should fill the following table. Describe each page, detailing the services it offers and the actions the user can perform, and screenshot of each page. You can consider the homepage as one of the 5 pages.

Important Notice: You should keep the size of screenshots reasonably small; however, it is essential to ensure their resolution is high enough.

Page ID	Title	Description	Screenshot
1.			
2.			
3.			
4.			

7 Maintenance

7.1 Database recovery & backups

You should explain the importance of database recovery and backups and illustrate in detail the steps for backup and recovery, including screenshots. This should cover both export and import procedures (around 1 page).

7.2 Database maintenance in general

In this section, you are required to conduct research and include in your response the significance of database maintenance. Discuss different methods of database maintenance. Your answer should be approximately one page in length.

8 Testing

8.1 Data Validation

You should test the following:

- **All cases of Primary Key:** You should select a primary key from one of your tables and test its two main characteristics: uniqueness and non-null. In your description, explain which primary key you will test and from which table, as well as what exactly you will test. In the screenshots, you should display the test query **and** its result, showing whether it executed successfully or resulted in an error with explanation.

- **All cases of FK:** You should select a foreign key from one of your tables and test its three main characteristics. In your description, specify which foreign key (FK) you will test, from which table, and its original PK table. Detail what exactly you will test for each case.

    - **Non-existent PK:** Test adding a value for the FK in a table that does not exist in the original PK table.

    - On Delete Cascade or On Update Cascade: Test deleting/updating a PK from the original table and observe the consequent deletion/update of the corresponding FK in the connected table due to the ON DELETE CASCADE/ ON UPDATE CASCADE rule.

    - One of the cases (Restrict/ No action/ set null/ default) for one delete or on update.

    - In the screenshots, display the test query and its results, showing whether it executed successfully or resulted in an error.

- For the remainder of the testing, select **at least two to three** constraints to test from the following: unique, default, not null, check, values. For the unique constraint test, choose any attribute that is not a primary key.

- Important Notice: You should keep the size of screenshots reasonably small; however, it is essential to ensure their resolution is high enough.

Number	Type	Description	screenshot
1.	All cases of PK		
2.	All cases of FK		
3.	Unique		
4.	Default		

5.	Not null		
6.	Check		
7.	……		

8.2 Output Validation

You should add a variety of queries, including direct queries, views, and procedures, with at least 4 four validations: for example:

- A 'Select' query with a 'Where' condition.
- Operations for 'Insert', 'Update', and 'Delete'.
- Use of an aggregation function along with 'Group By'.

In the description, explain what you intend to perform (i.e., describe the objective rather than the actual query command). For the screenshot and result, take a screenshot and remember the screenshot should display the query command alongside the results.

For result validation: You should demonstrate that the query results are correct. You can take screenshots of the actual table and explain how the results match the expectations.

Important Notice: You should keep the size of screenshots reasonably small; however, it is essential to ensure their resolution is high enough.

Number	Query Description	Screenshot (query + result)	Result validation
1.			
2.			
3.			
4.			

8.3 Security Validation

You can conduct tests for either one user or multiple users. It is necessary to test both the privileges that have been granted and those that have not been granted. Ensure that you test at least four cases for both scenarios: **privileges given**, and **privileges not given**.

Important Notice: You should keep the size of screenshots reasonably small; however, it is essential to ensure their resolution is high enough.

Number	Username	Description of privilege/no privilege	Screenshot (query + result)
1.			
2.			

3.			
4.			
…			

8.4 GUI Validation

- In this section, we will test whether the data outputs from the GUI are accurate and whether the GUI is correctly connected to the database, ensuring it reflects the tables and views correctly.
- You should include 4 to 5 test cases, such as displaying data, inserting data from the GUI, updating data from the GUI, etc.
- Important Notice: You should keep the size of screenshots reasonably small; however, it is essential to ensure their resolution is high enough.

Number	Description	screenshot
1.		
2.		
3.		
4.		

8.5 Assess whether meaningful data has been extracted

- You are required to explain and demonstrate that your database is populated with meaningful data. Your explanation should cover all cases, including multi-value attributes, 1:M relations, and M:N relations.
- Additionally you should explain how you have created meaningful views and procedures, including their aims and functionalities, and users who can benefit from it.
- Conclude by asserting how your database will be beneficial for the users.
- Your answer should not be general and uses examples from your database in the explanation.

8.6 Assess the effectiveness of testing

- Explain the significance of the testing process.
- Detail the steps you followed in your testing and the importance of each step. Refer to the Testing section to assist in crafting this part of your answer.
- Mention how testing helped in identifying bugs, security issues, or inadvertent errors and connections.
- This section should be approximately half to one page in length.

9 Evaluation of database solution

9.1 Effectiveness of the database solution based on user and system requirement

In this section, you should assess how well the database solution aligns with the user and system requirements.

- Begin by analysing whether the system fulfils its intended purpose and objectives.
- Compare your achievements against the listed requirements, clearly stating what you've accomplished and how you've done so.
- Additionally, identify any unmet requirements and provide explanations for why they were not achieved.
- If you have incorporated any new requirements that were not initially mentioned in Part 1, please detail them and explain the reasons for their inclusion.
- Ensure that your response is not presented as a list of points; instead, it should include an introductory paragraph and a concluding one.

9.2 Suggested improvements

In this section, your task is to offer constructive feedback regarding areas where the database solution can be enhanced or optimized. Specifically, pinpoint the existing shortcomings or weaknesses in the current solution. These improvements can encompass various aspects, including design, the introduction of new entities, the addition of attributes, and concerns related to security and scalability. In addition to business aspects. Clearly outline these suggested improvements and provide reasoning behind each recommendation.

9.3 Evaluation based on improvements needed

This section focus around evaluating how the suggested improvements mentioned in Section 6.2 would impact the overall effectiveness of the database solution. Begin by discussing the potential benefits that would result from implementing the recommended changes. Additionally, consider any potential challenges or trade-offs that may arise during the implementation process, such as increased development time or additional resource requirements. Provide a comprehensive assessment to help measure the impact of these improvements on the database solution's performance and functionality.

10 User Documentation

10.1 System Overview

- Provide a brief introduction to the database system, including its purpose and key features including overview of the database system's capabilities, types of data stored and managed, basic architecture and components of the system from user perspective not from technical perspective.

10.2 Using the system

Note: describe the system by its pages and functionalities per users. You need to add screenshots.

Offer detailed instructions on how to use the system (GUI), catering to different user roles.

- Structure: Divide this section based on different user roles or tasks.
- Detailed Steps: For each task or role, provide step-by-step instructions.
- Screenshots: Include clear screenshots for each step to visually guide the user.
- Functionalities: Describe the functionalities available on each page of the system.
- Due to GUI tool limitations, add screenshots for one of the users.

10.3 Frequently asked questions

- Compile a list of common **questions** and provide concise, helpful **answers**.
- Include troubleshooting tips for typical problems. - Minimum 4 questions with answers.

10.4 Contact information

- Include contact information for technical support, such as email, phone numbers, and operating hours.
- Mention any online resources or forums where users can seek help or share experiences.