

**Department of Computer Science & Engineering**

**V SEMESTER**

**Software Engineering- UE20CS303**

Aug-Dec, 2022

**PROJECT REPORT**

**ON**

**SMART SYSTEM FOR ASTHMATIC PATIENTS**

SUBMITTED BY

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**TABLE OF CONTENTS**

|  |  |  |
| --- | --- | --- |
| Sl No | TOPIC | PAGE No |
|  | PROPOSAL OF THE PROJECT | 1 |
|  | SOFTWARE REQUIREMENTS SPECIFICATION | 2-9 |
|  | PROJECT PLAN | 10-11 |
|  | DESIGN DIAGRAMS | 12-13 |
|  | TEST CASES | 14-15 |
|  | SCREEN SHOTS OF OUTPUT | 16 |

1

**TEAM NO: 7**

**PROJECT PROPOSAL:**

The project aims to create a set-up that will:

* monitor the air quality levels in the environment of a patient to warn them regarding the risk and suggest they carry their inhaler.
* set reminders for the patient to take the inhaler dosage on time.

Functions performed by product:

* A module (python) will be used to receive data from the sensors.
* Another module will process the data received from sensors and classify the environmental conditions as harmful or normal.
* A phone application will be the interface where the patient can view the data related to inhaler usage and environmental conditions.
* A database will keep track of air quality levels.



2

PES UNIVERSITY, BANGALORE

Department of Computer Science and Engineering

**Software Requirements Specification**

**Version 2.0**

**DATE CREATED: 11/09/2022**

**Table of Contents**

|  |  |
| --- | --- |
| Top |  |
| **Table of Contents**  **Revision History** | i - ii |
| **1. 1. Introduction**  1.1 Purpose  1.2 Intended Audience and Reading Suggestions  1.3 Product Scope  1.4 References | 1 |
| **2. 2. Overall Description**  2.1 Product Perspective  2.2 Product Functions  2.3 User Classes and Characteristics  2.4 Operating Environment  2.5 Design and Implementation Constraints  2.6 Assumptions and Dependencies | 2-3 |
| **3. 3. External Interface Requirements**  3.1 User Interfaces  3.2 Software Interfaces  3.3 Communication Interfaces | 3 |
| **4. Analysis Models** | 4 |
| **5. System Features** | 4- 5 |
| **6. 6**. **Other Non- functional Requirements**  6.1 Performance Requirements  6.2 Safety Requirements  6.3 Security Requirements  6.4 Software Quality Attributes  6.5 Business Rules | 5-6 |
| **7. 7. Other Requirements**  **Appendix A: Glossary**  **Appendix B: Field Layouts**  **Appendix C: Requirement Traceability matrix** | 6 |

3

**Revision History**

**SRS Version 2.0 - revised on 24.11.2022**

4

1. Introduction
   1. Purpose

The purpose of this document is to provide an overview of the project Smart Inhaler including detailed description of the project’s deliverables. This document describes all ideas that define the system, outline concepts that must, should and could be developed. Requirements (hardware and software), user interface and target audience are documented as well. A requirement traceability matrix (RTM) is maintained in this document to keep track of progress.

* 1. Intended Audience

The product is intended for:

* Clients, primarily patients of asthma or patients having breathing problems.
* Professors who will review the project.
* Developers who will work on the project.

* 1. Product Scope

This project focuses mainly on asthmatic patients and monitors regular dosage and also sets reminders for the same. The project also aims to collect vital data from the client’s environment to predict the use of inhaler. It is important for patients (and doctors) to keep track of their dosage to avoid their condition from worsening and this product aims to achieve this goal.

* 1. References

[IoT Based Smart Inhaler For Context-Aware Service Provisioning | IEEE Conference Publication | IEEE Xplore](https://ieeexplore.ieee.org/document/9333427)

5

# Overall Description

# Product Perspective

# The proposed product is a self- contained product.

# Asthma is a chronic disease which is very prevalent. According to the World Health Organisation (WHO), asthma affected an estimated 262 million people in 2019. Their website also suggests that regular inhaled medication can control asthma symptoms and that avoiding asthma triggers can help reduce asthma symptoms.

# This project builds on these two statements.

## Product Functions

## Objectives of the product:

## Authenticate the user through login credentials.

## Provide the user with information about the environmental conditions.

## Alert the user about deteriorating environmental conditions that could cause an asthmatic trigger.

## Setup reminders for the user to take medication on time.

## User Classes and Characteristics

## This product is meant for patient use only. The user alone must have access to all personal data.

## Operating Environment

## The product uses Raspberry Pi 4 and sensors connected to a computer running Raspbian OS to facilitate communication between sensors and the program.

## Design and Implementation Constraints

## This product is a prototype for a single user, but as the number of users increases, the need for bigger memory storage is required.

6

## Assumptions and Dependencies

## Not Applicable

1. External Interface Requirements
   1. User Interfaces

The user interface is required to authenticate the user and display information regarding the environmental conditions and time of next dosage.

It consists of:

* Login Page
* Main Page- containing user profile, reminder for next dose, graph displaying current environmental conditions
  1. Software Interfaces

Programming language- Python 3.7

Database- Excel

* 1. Communications Interfaces

To enable communication between program and mobile application Bluetooth Low Energy (BLE) module can be used.

For communication to and from sensors MQTT protocol or Ethernet to USB adapter can be used.

* 1. Hardware Interfaces

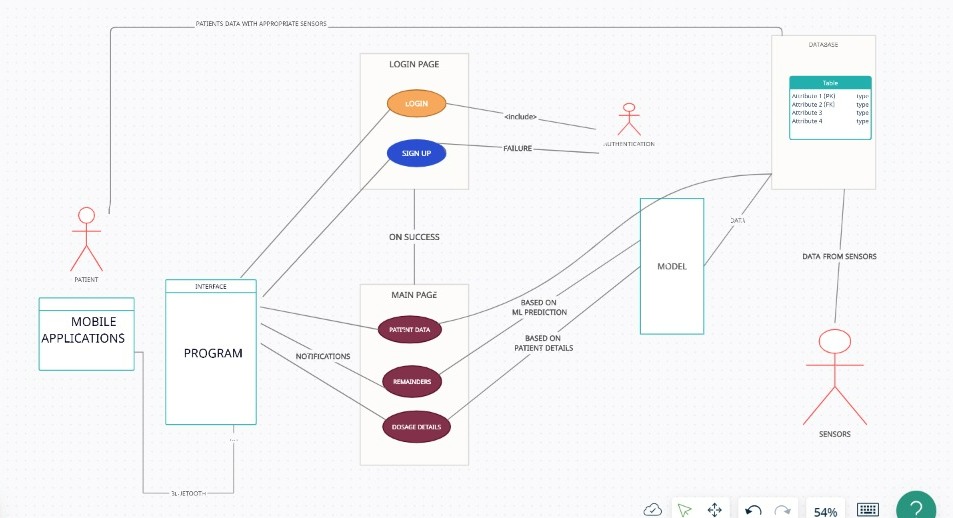
Raspberry Pi 4, sensors and the connecting wires

Computer- Receives data from sensors and processes it (program). It also sends signals to the mobile application.

Mobile- runs the application for client; where they receive notifications

7

1. Analysis Models



1. System Features
   1. User Login
      1. Description and Priority

This feature is of high priority as it is essential to protect the user’s personal information.

* + 1. Stimulus/Response Sequences

The user will first register on the application and provide a suitable username and password along with their email- id.

For successive login, the user will have to fill in these fields again and after authentication will be redirected to the user profile page (main page).

8

* + 1. Functional Requirements

REQ-1: Requires a database containing the login details of users to which the values will be compared.

REQ-2: In case the user fills in incorrect values for the fields, an appropriate error message will be displayed for the same.

* 1. User Profile
     1. Description and Priority

This feature is of high priority as it displays user- related information such as time of next dose, environmental conditions (temperature, humidity, air quality).

* + 1. Stimulus/Response Sequences

The data received from the sensors is processed and is used to determine whether the weather conditions are a risk for the patient’s health or not.

The patient is alerted through messages sent via Bluetooth and an alarm to locate the inhaler, if not in close proximity.

The same information is displayed on the application as well.

* + 1. Functional Requirements

REQ-3: Data from the sensors should be processed quickly.

REQ-4: The alarm should be set off if the patient is far from the inhaler.

1. Other Non- functional Requirements
   1. Performance Requirements

Data collected from sensors every 5 seconds to avoid clamming of data.

User profile page must be loaded within 5 seconds of logging in if correct credentials are given.

Data displayed on profile page must be updated with 5 seconds.

* 1. Safety Requirements

Invalid/ unauthorised logins must be prevented.

Specify range of values within which the air quality must lie to be classified as normal or harmful.

9

* 1. Security Requirements

The data created by the sensors is personal and must be protected from sniffers, using encryption techniques.

* 1. Software Quality Attributes

The product is portable.

Quality of the sensor determines accuracy.

Tested by taking data from pre- defined databases.

* 1. Business Rules

Not Applicable

10

**PROJECT PLAN**

Lifecycle to be followed for the execution of our project is Legacy Software Development Life Cycle - Prototype model.

We will start with sample implementation(prototype) of software requirements and if and only if the prototype is working well, we will evolve versions for implementation. When there are any changes to the requirements, we will be designing, modifying and adding new functional capabilities.

Tools to be use throughout the lifecycle –

Planning Tool – Jira

Design Tool – Jira

Development Tool – Jupyter Notebook, MySql

Bug Tracking – Jira

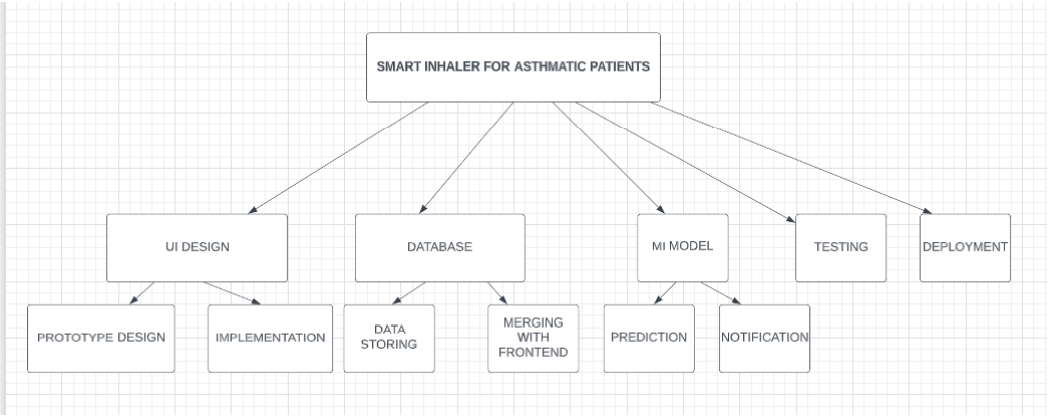
Testing Tool –

Deliverables –

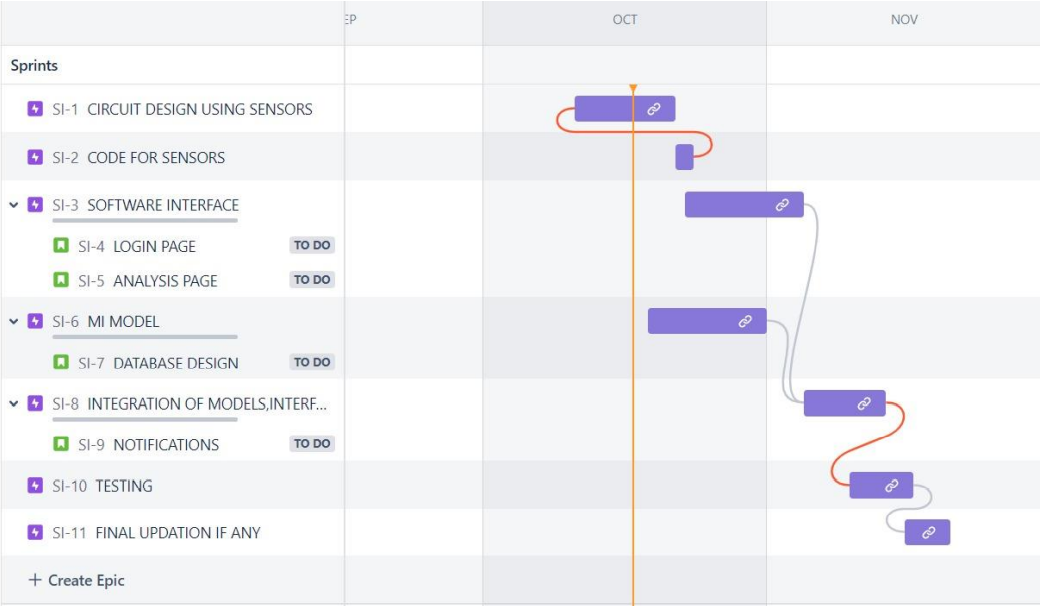
* User Login/Authentication
* User database
* User interface
* Designing a circuit (Inhaler)
* ML Model (Prediction &Notification)

11

WBS for entire functionalities of SMART INHALER FOR ASTHMATIC PATIENTS



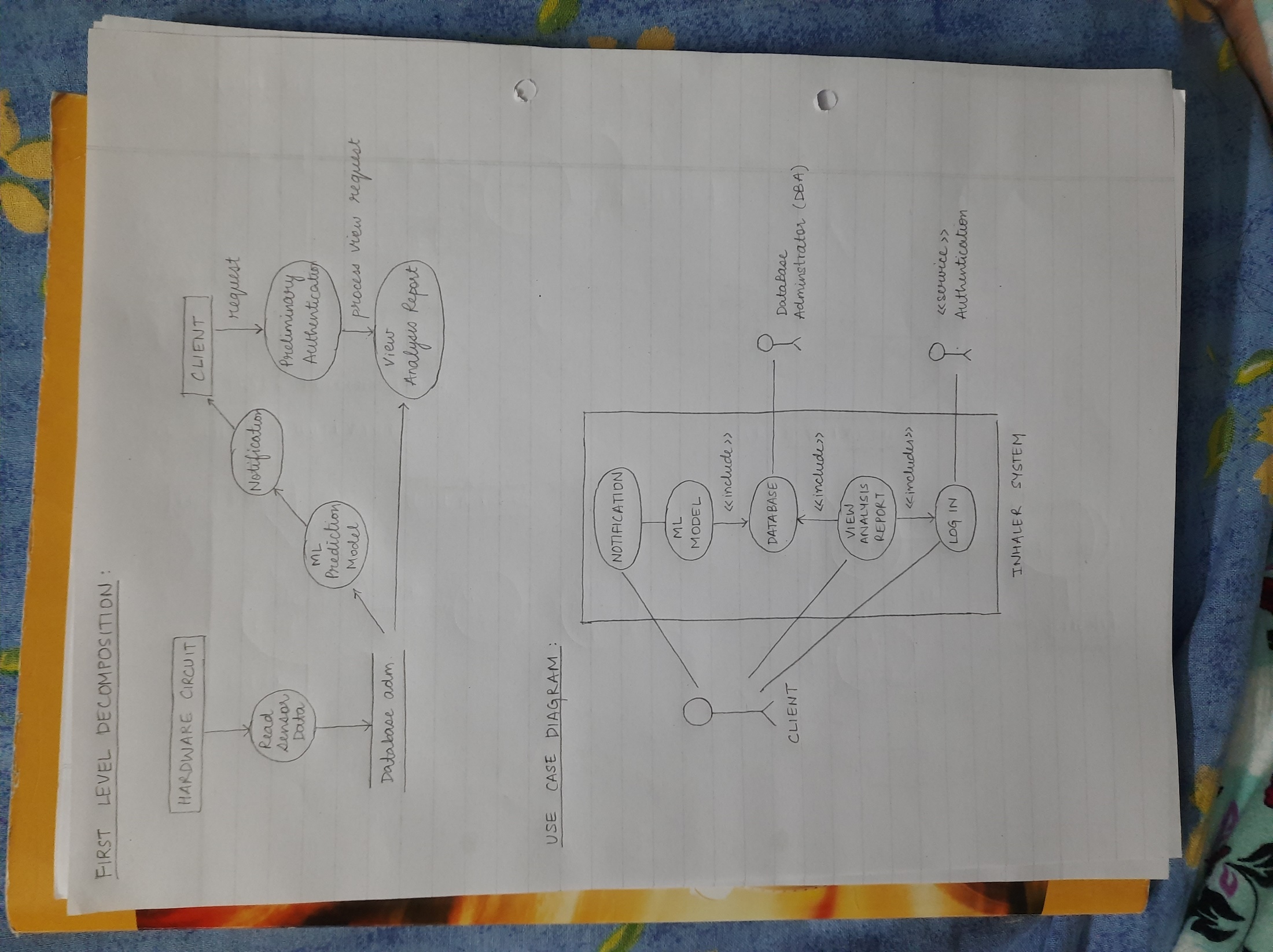
GANTT CHART



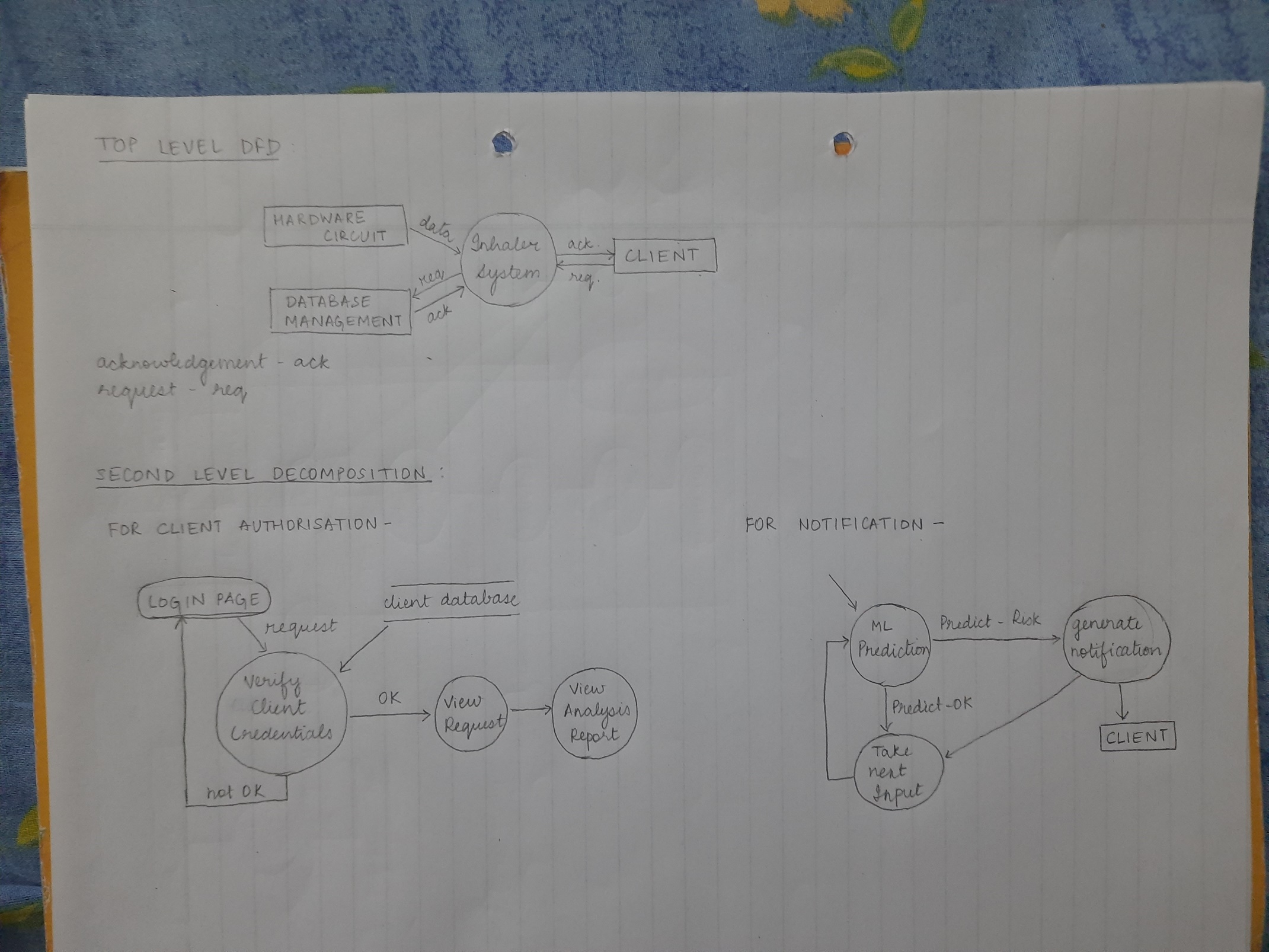
12

**DESIGN DIAGRAMS**

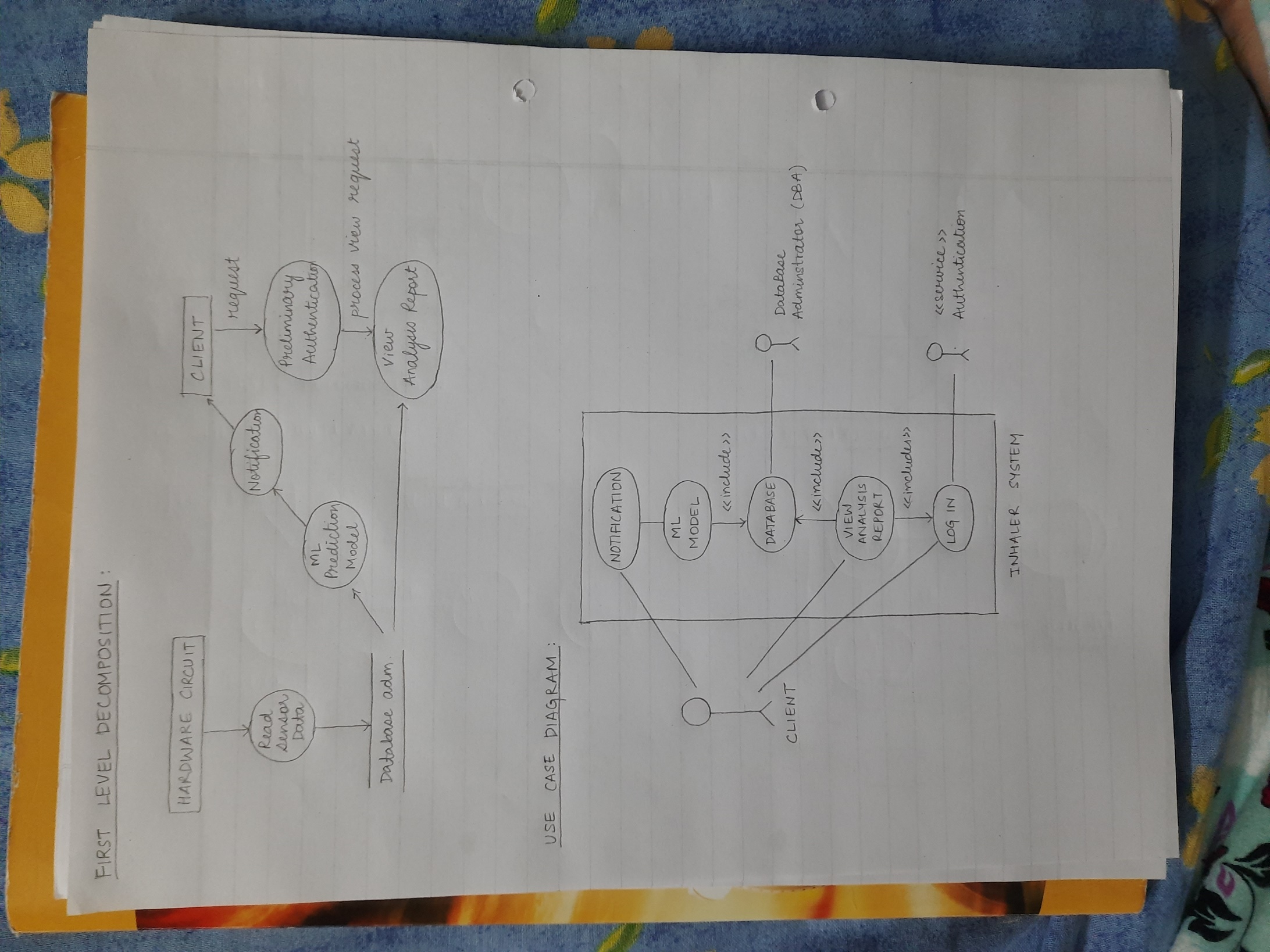
USE CASE DIAGRAM:

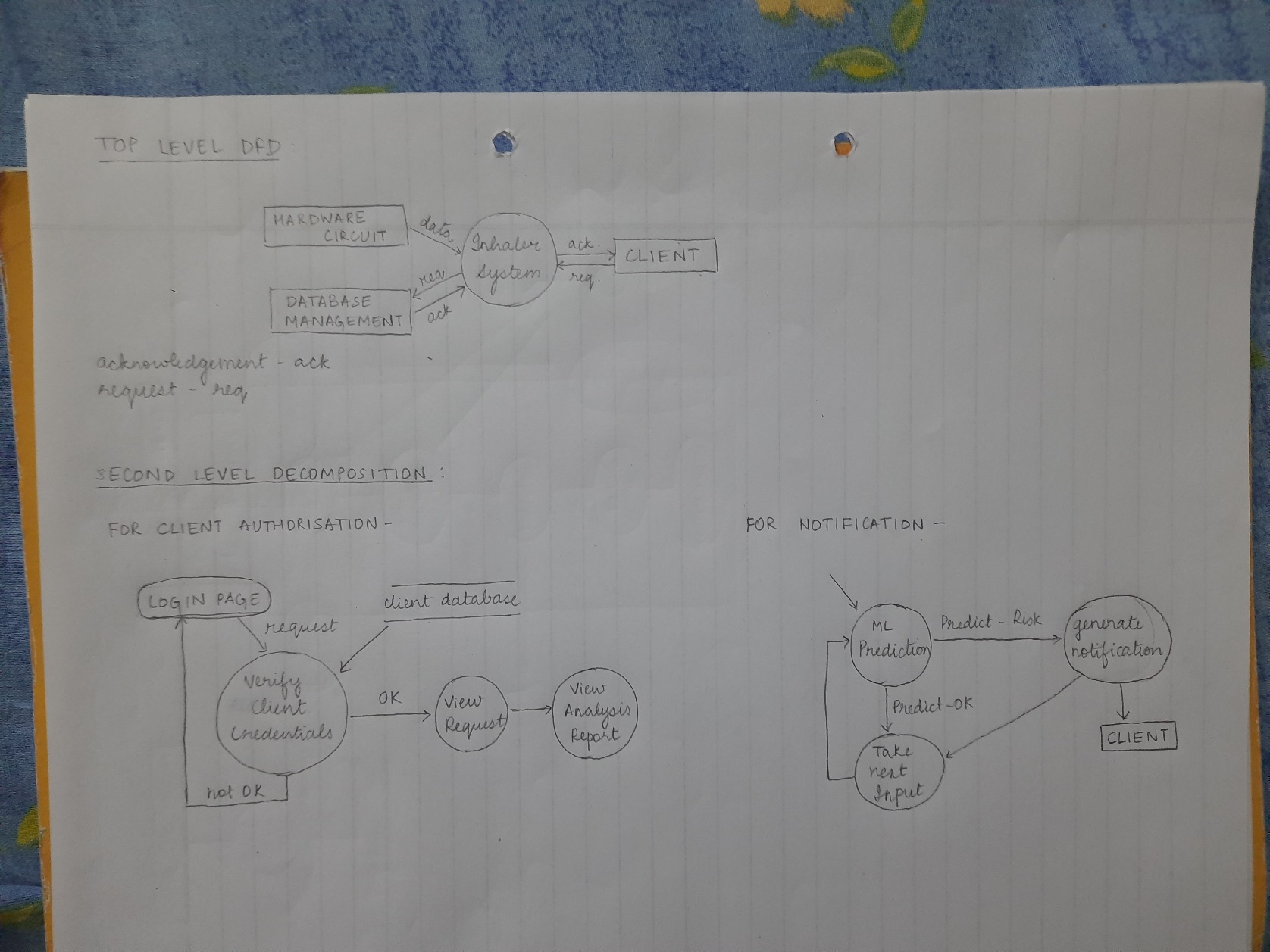


DATA FLOW DIAGRAM:



13





**TEST CASES:**

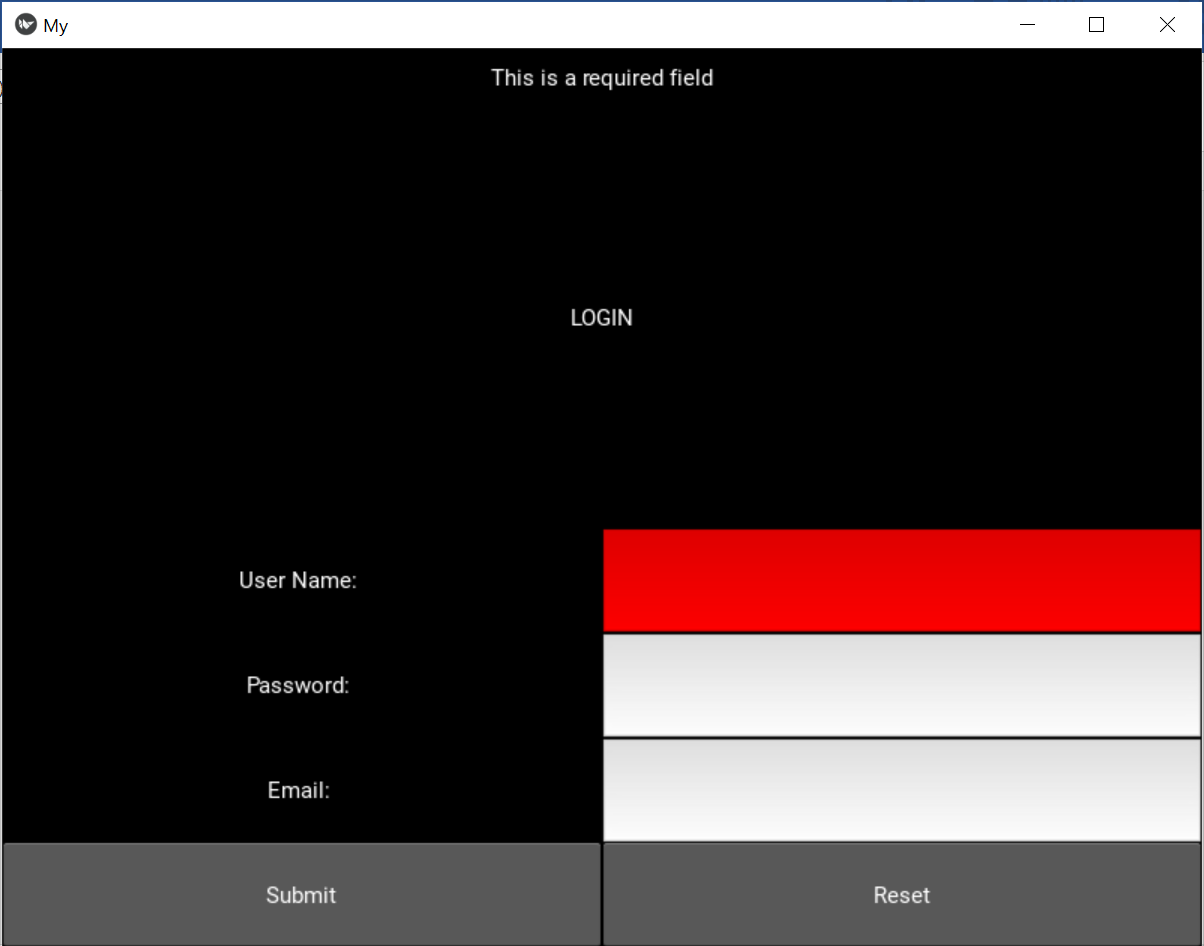
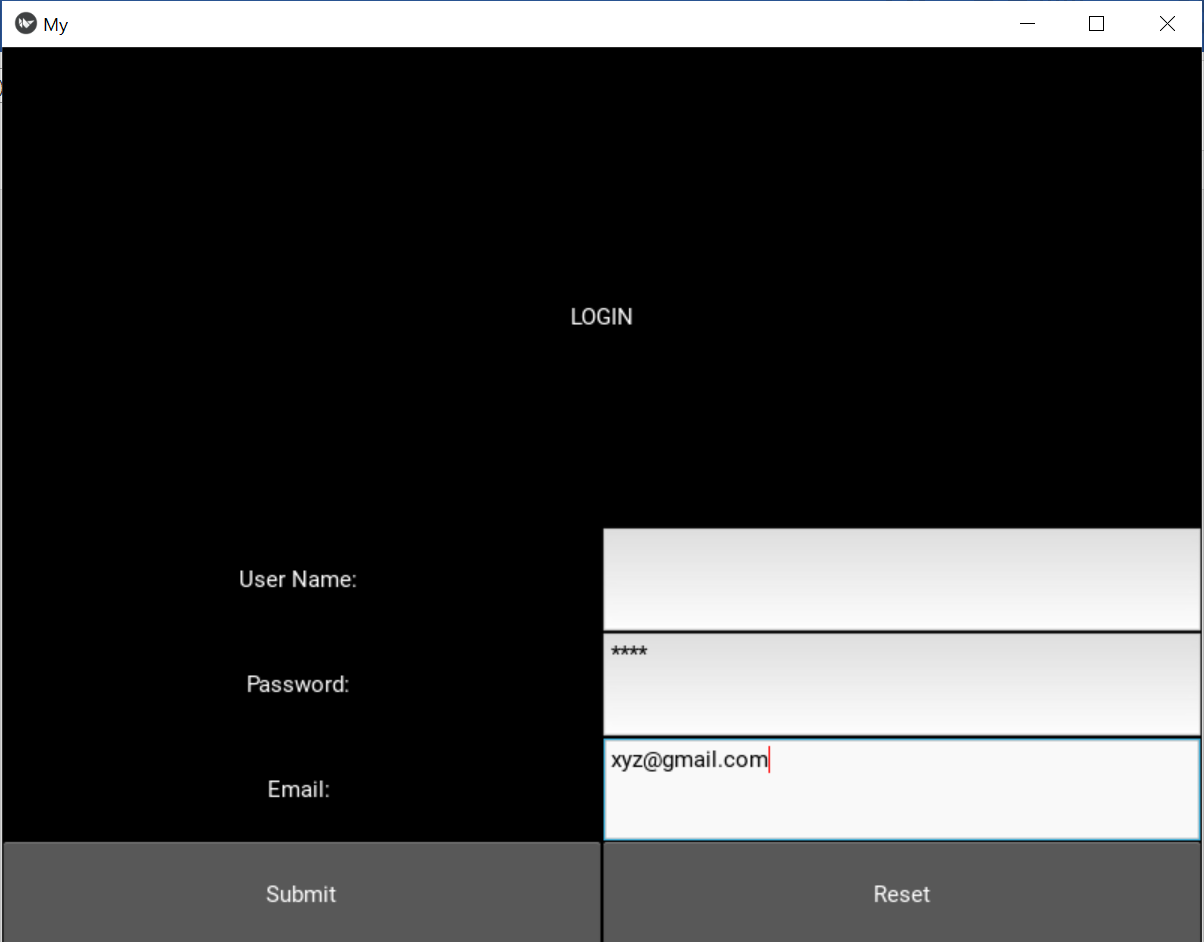
Valid Details:

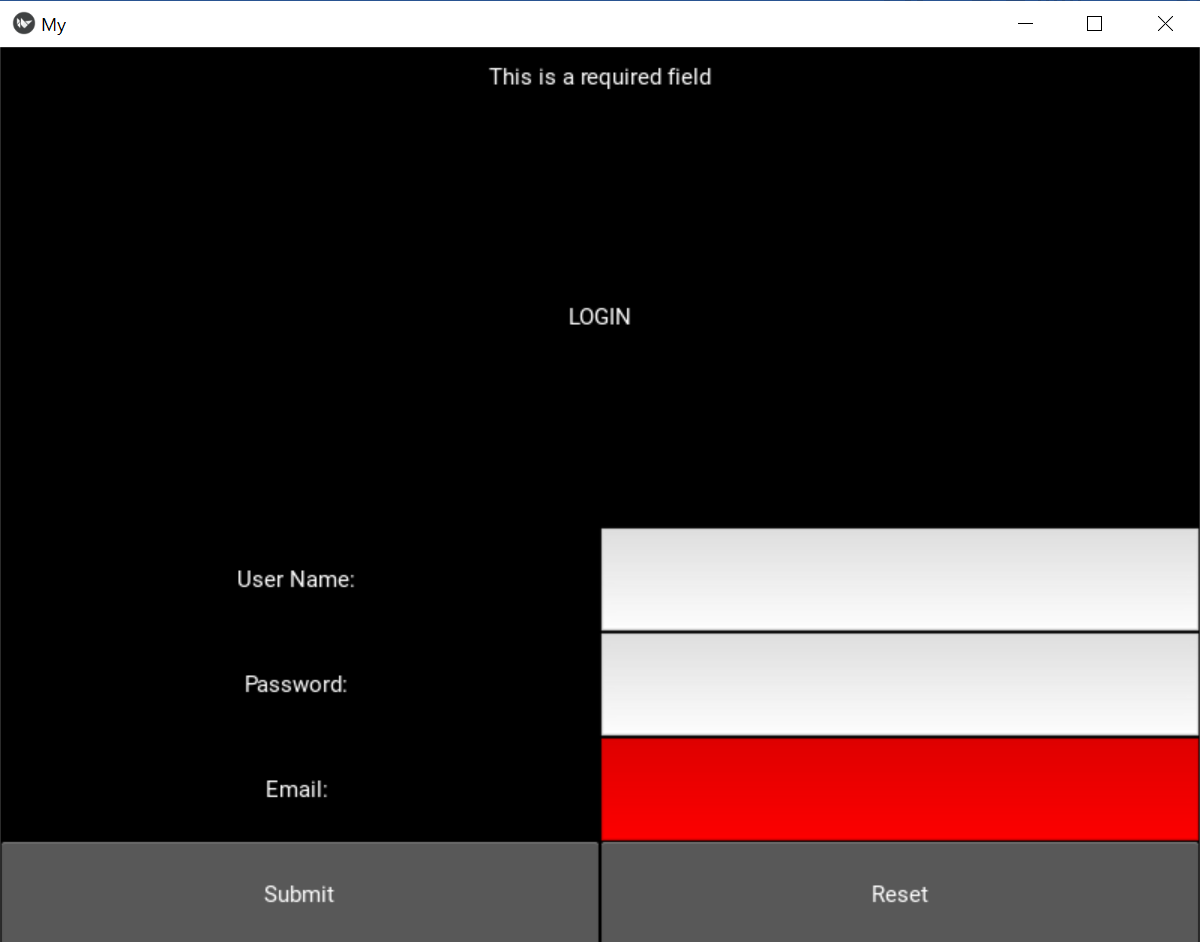
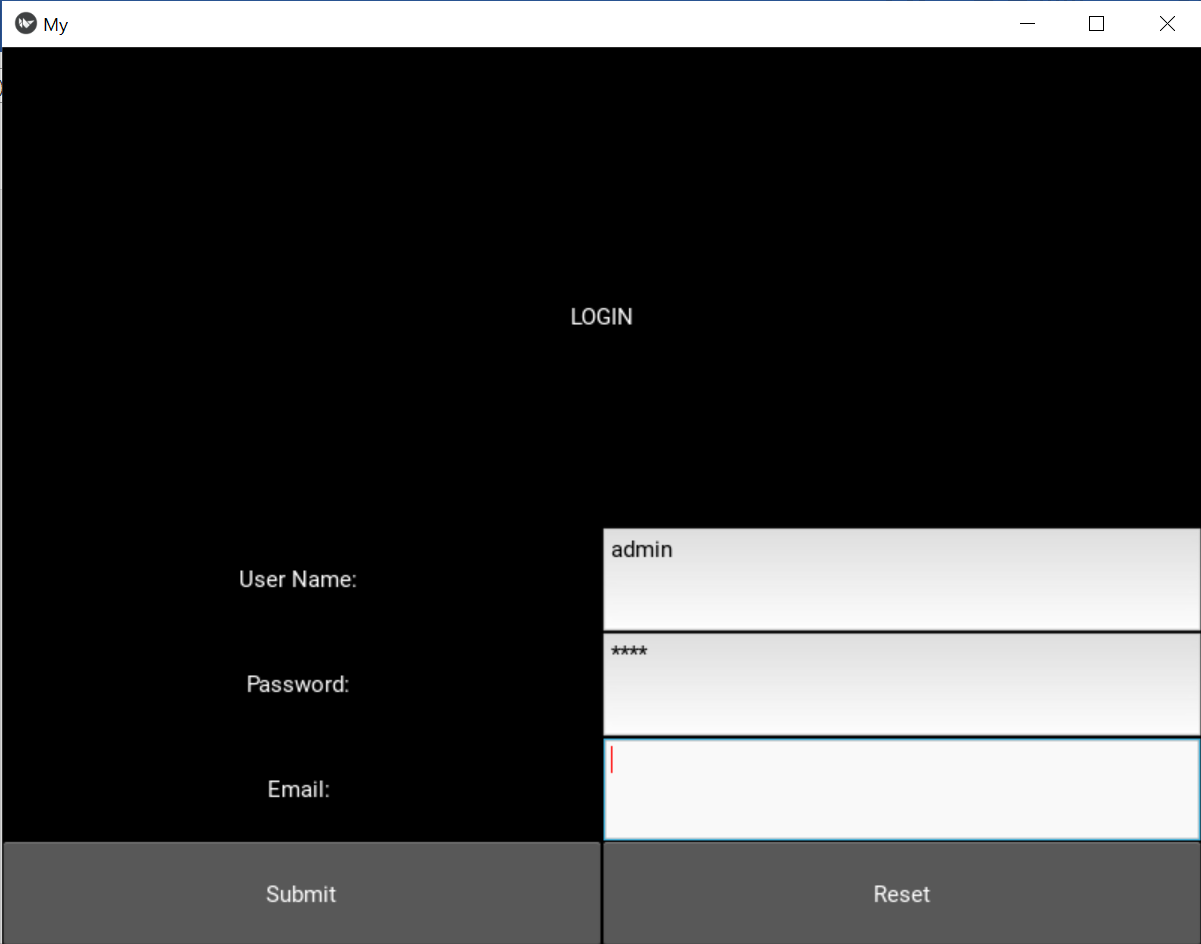
Username: admin

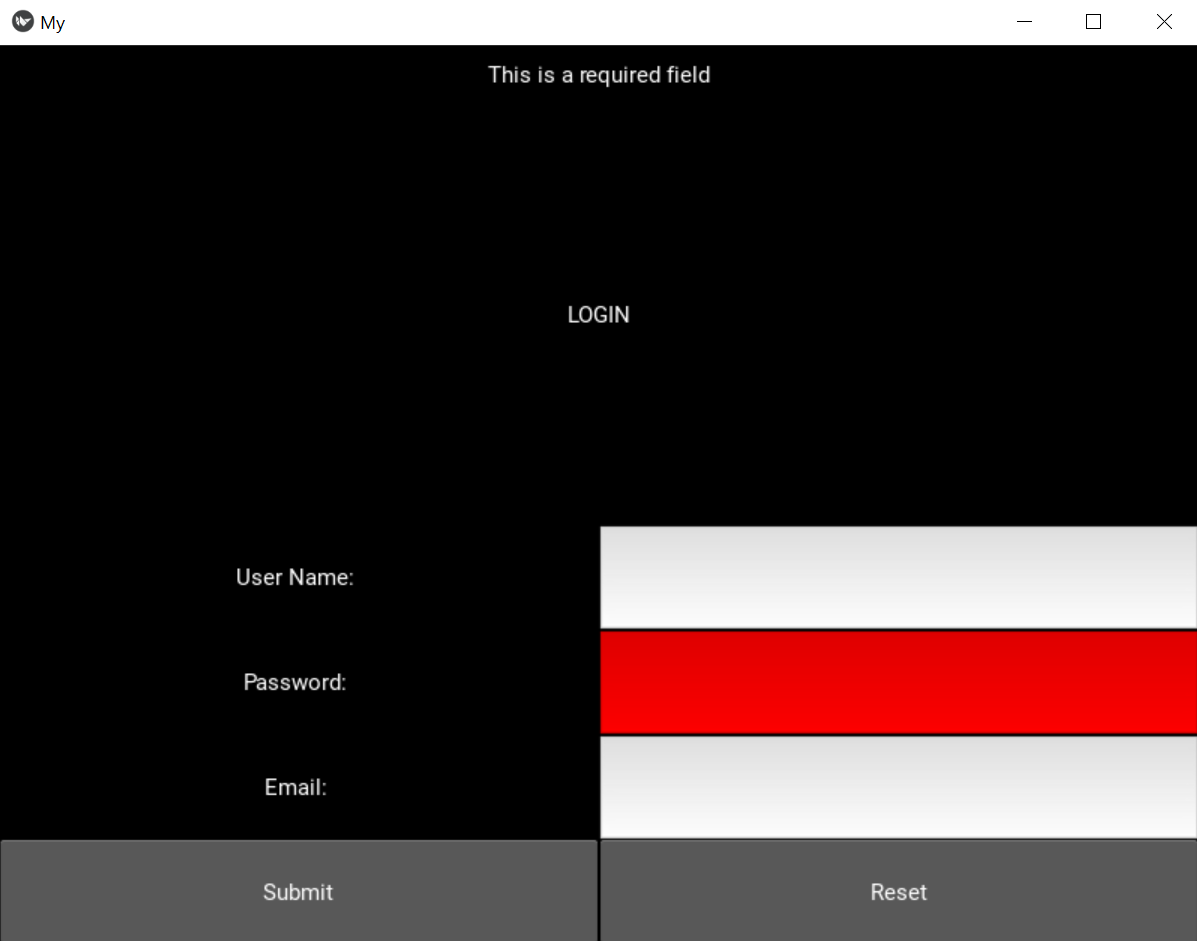
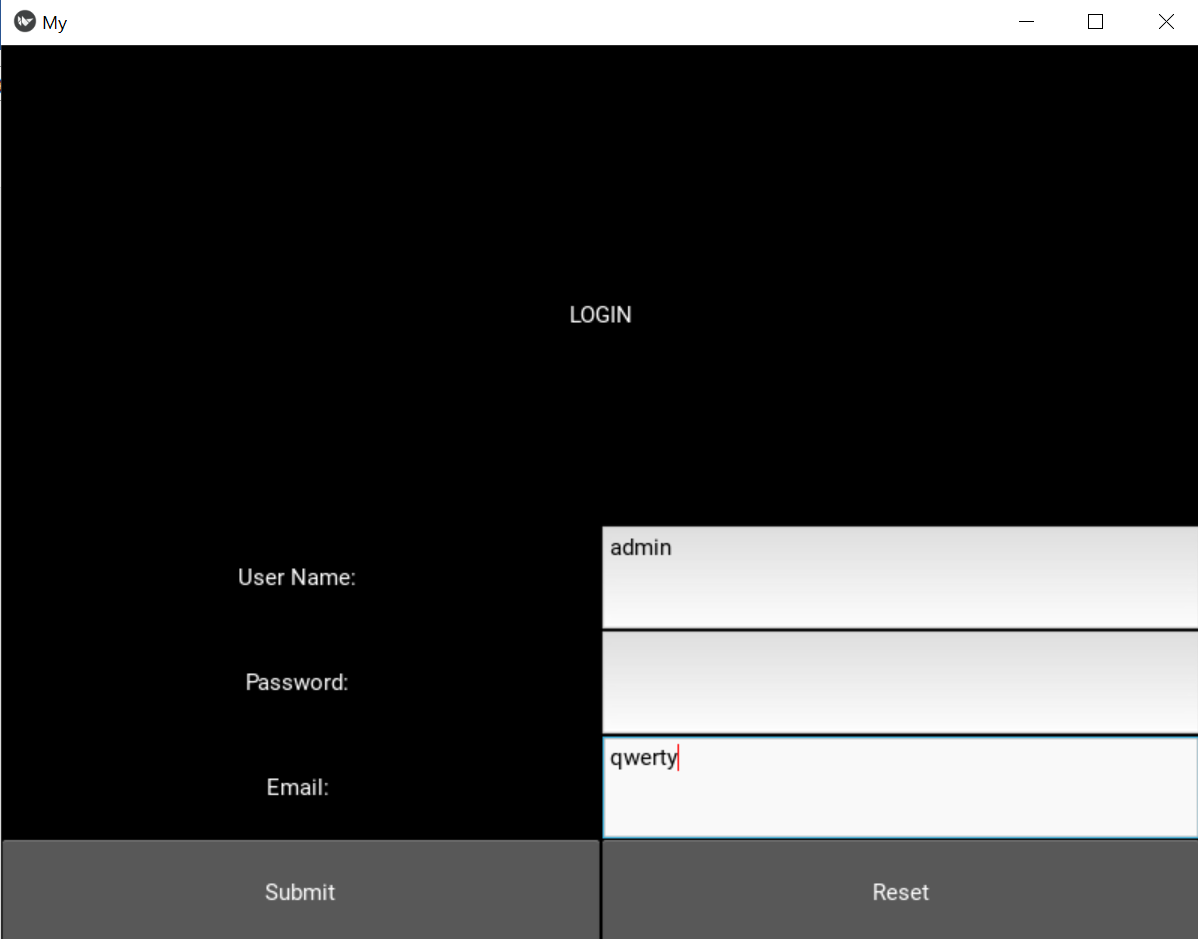
Password: useradmin@123

14

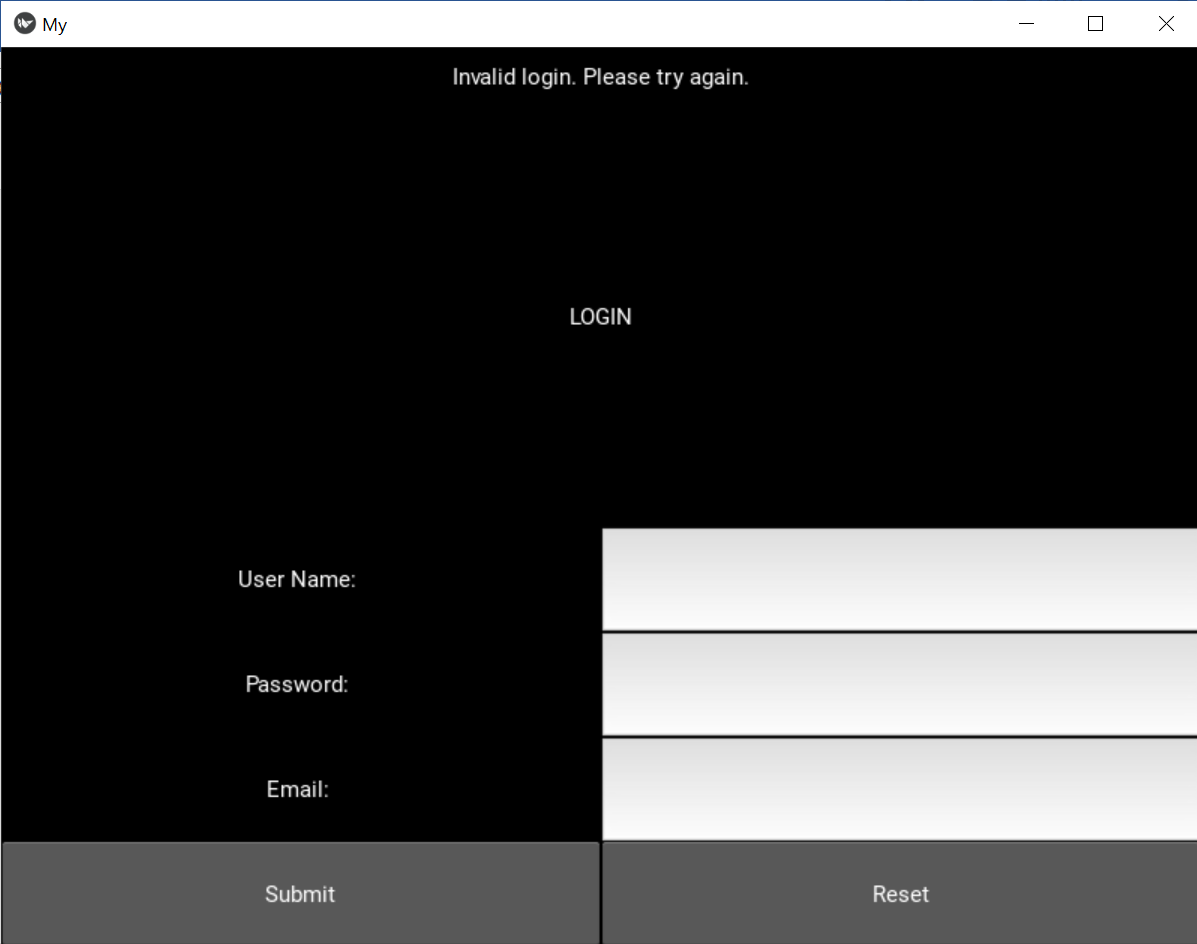
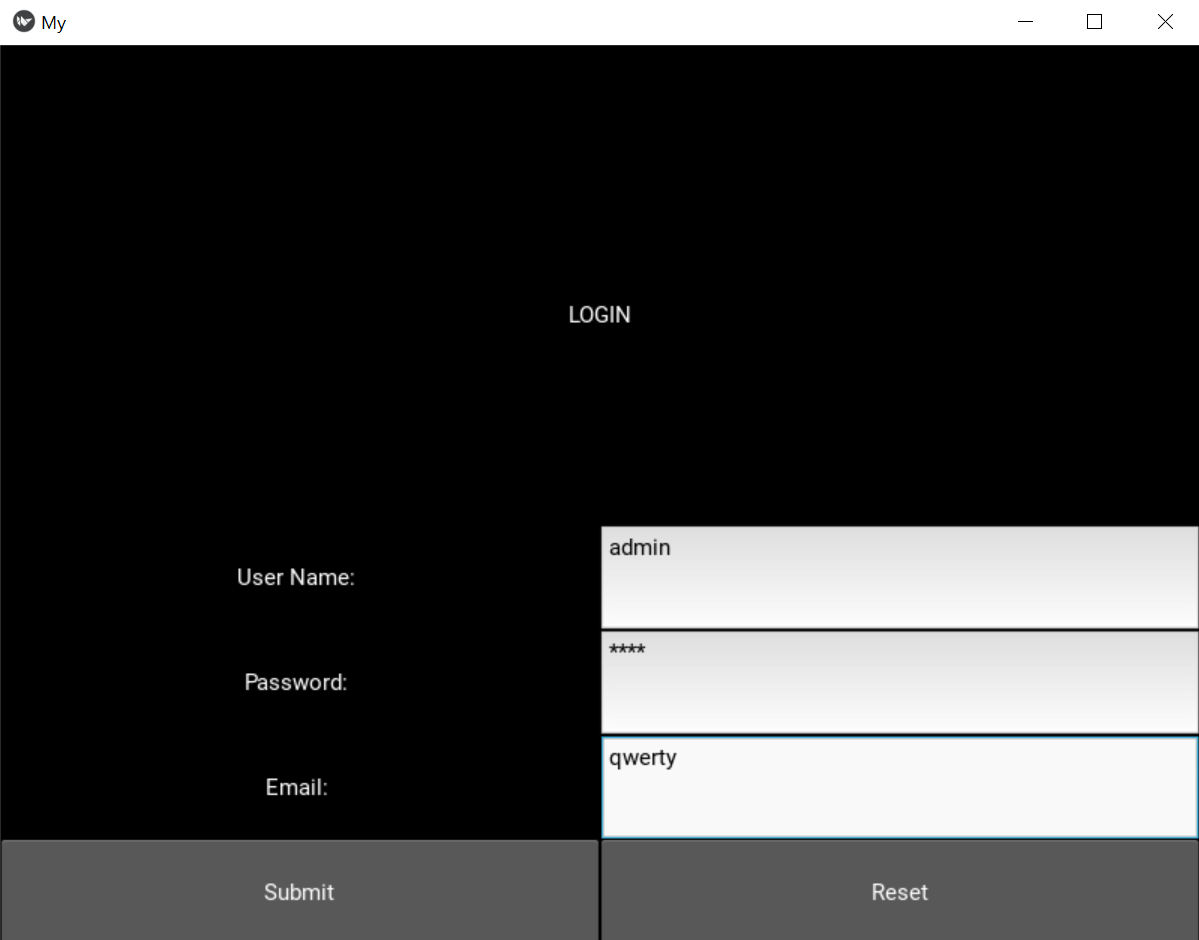
TEST CASES:

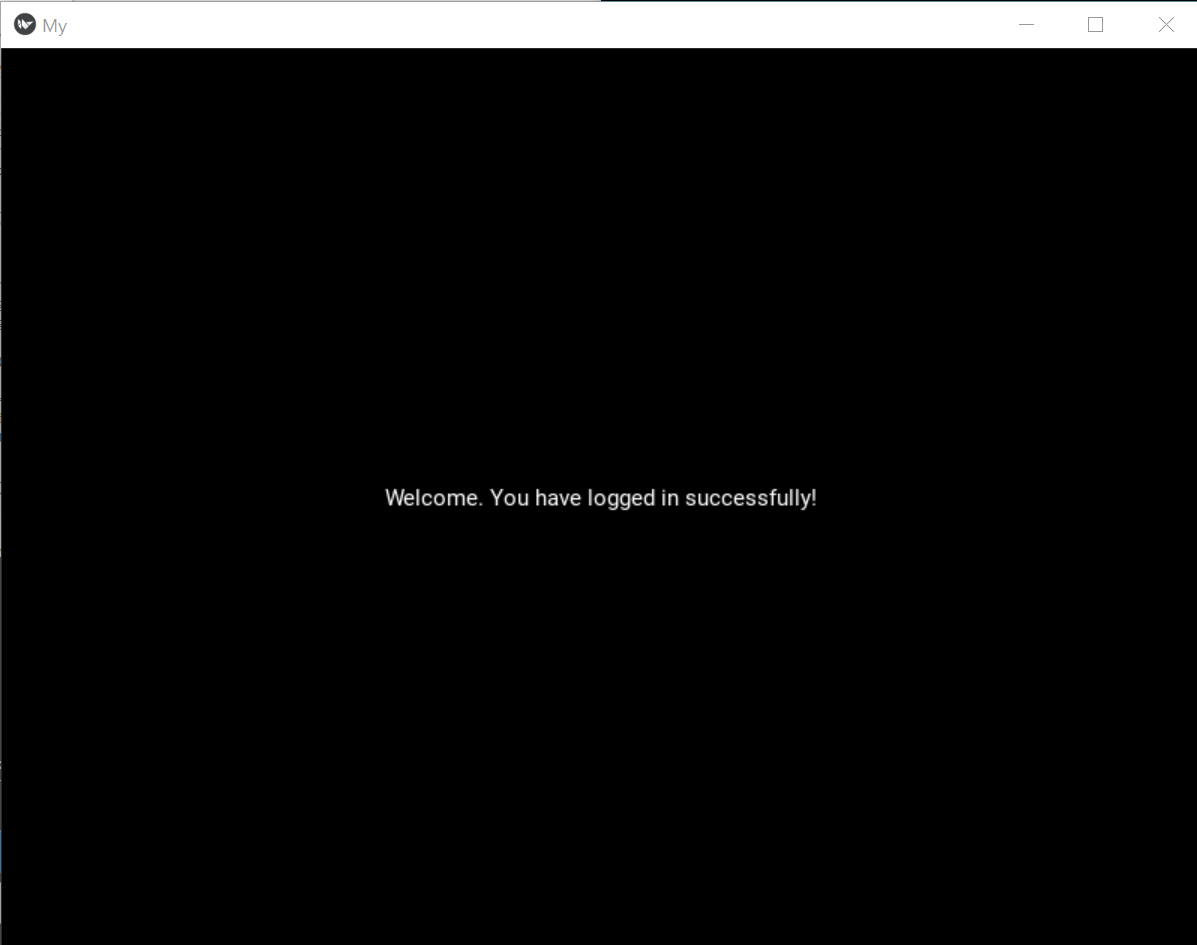
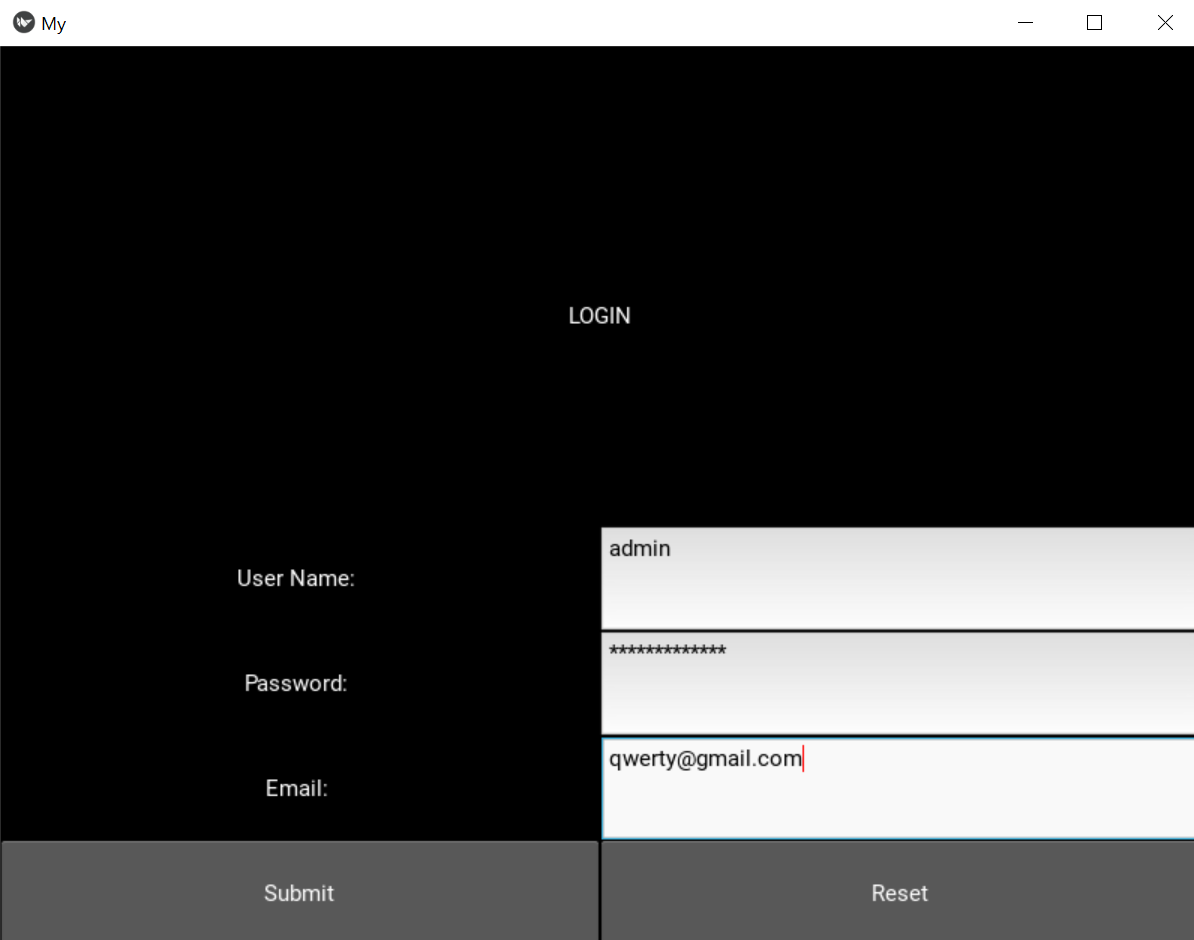






15





|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Test Case ID | Name of Module | Test case description | Pre-conditions | Test Steps | Test data | Expected Results | Actual Result | Test Result |
| UT-01 | login\_page | Username field empty |  |  |  | Required field | Required field | Pass |
| UT-02 | login\_page | Email field empty |  |  |  | Required field | Required field | Pass |
| UT-03 | login\_page | Password field empty |  |  |  | Required field | Required field | Pass |
| UT-04 | login\_page | Invalid password |  |  |  | Invalid login details | Invalid login details | Pass |
| UT-05 | login\_page | Valid Credentials |  |  |  | Success login | Success login | Pass |
|  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |

16

FINAL OUTPUT SCREENSHOTS:

