CS3052 - Computer Security

Continuous assessment 02

Protection of information based on sensitivity and privilege levels

Name : W. G. C. Silva

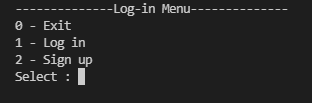
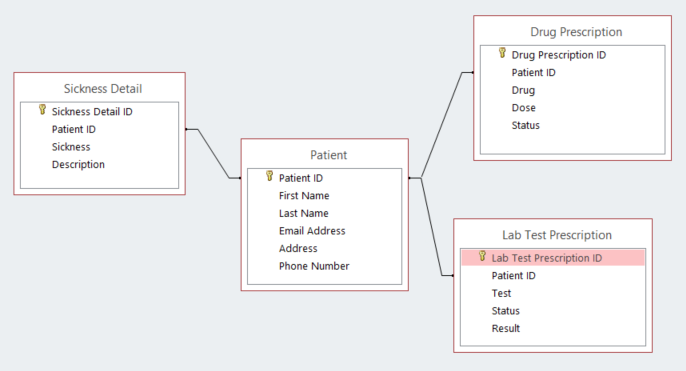
Index No : 180607R

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**Program Description**

* The “Medical Data Processing System” handles data in a Medical Center.
* The System has 4 types of users:
  + Doctors
  + Pharmacists
  + Lab Technicians
  + Patients
* User data is stored in the ***“config.txt”*** file. Each record in the file contains a name, email, hashed password and a privilege level of a user.
* A Microsoft Access database was used to store the Patient data. It is stored in the “***db***” folder under the name “***MedicalDataProcessingSystemDB.accdb***”.
* The database has 4 tables:
  + Patient table
  + Sickness Detail table
  + Drug Prescription table
  + Lab Test Prescription table
* The tables have the following fields and relationships:



**Logging in**

* A user can log into the system by entering “1” in the Login Menu, then entering his/ her email and password. Passwords are hashed using the

hashed\_pw = hashlib.md5(password.encode())

Method. For this, “hashlib” library is imported in the source code.

**User Sign-up**

* A new user can register in the system entering “2” in the Login Menu.
* Then he/ she can choose what the user type is. Next, enter name, email and password. The password will be hashed, and this info will be saved in the ***“config.txt”*** file.

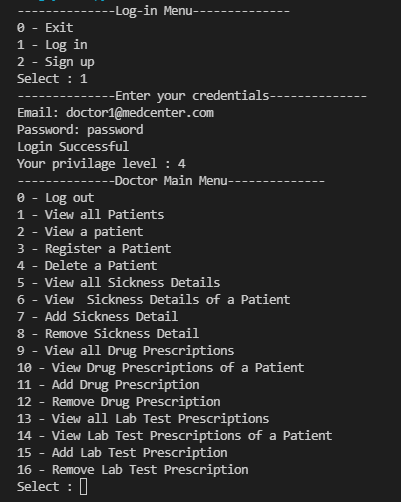
**User functionalities**

* Privilege levels for the user types are defined as follows:

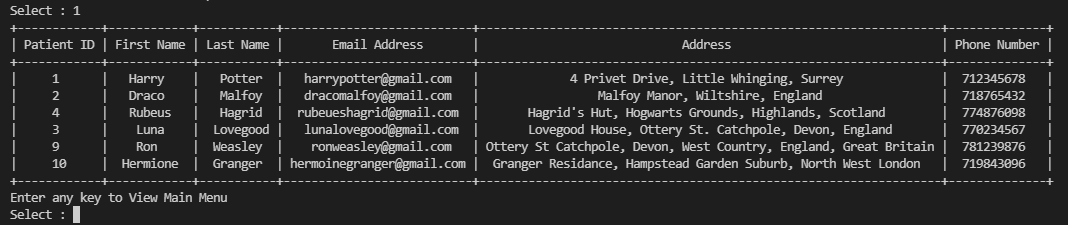
|  |  |
| --- | --- |
| **User Type** | **Privilege level** |
| Doctor | 4 |
| Pharmacist | 3 |
| Lab Technician | 2 |
| Patient | 1 |

* Based on the user types, the users have different levels of access to the data.
* When each user logs in, the permitted functionalities are showed in the terminal
* A doctor can view, create and delete records from all 4 tables. However he cannot enter some fields like the Status of a Drug Prescription record, the Status of a Lab Test Prescription record, and the Result of a Lab Test Prescription record. They will be set to default values when a doctor creates a record.
* A Pharmacist only has view permissions to the Patient table. He can view the Drug Prescription table, and update the Status field from “Prescribed” to “Issued”. He doesn’t have any permissions for the other tables.
* A Lab Technician only has view permissions to the Patient table. He can view the Lab Test Prescription table, and update the Status field from “Pending” to “Done”. He can also update the Result field of the Lab Test Prescription table. He doesn’t have any permissions for the other tables.
* A Patient only has permission to view his record from the 4 tables. He doesn’t have any other access to any of the tables.
* The complete functionalities of the users are as follows:
  + A doctor can:
    - View all Patients
    - View a patient
    - Register a Patient
    - Delete a Patient
    - View all Sickness Details
    - View Sickness Details of a Patient
    - Add Sickness Detail
    - Remove Sickness Detail
    - View all Drug Prescriptions
    - View Drug Prescriptions of a Patient
    - Add Drug Prescription
    - Remove Drug Prescription
    - View all Lab Test Prescriptions
    - View Lab Test Prescriptions of a Patient
    - Add Lab Test Prescription
    - Remove Lab Test Prescription
  + A Pharmacist can:
    - View all Patients
    - View a patient
    - View all Drug Prescriptions
    - View Drug Prescriptions of a Patient
    - Update Drug Prescription as issued
  + A Lab Technician can:
    - View all Patients
    - View a patient
    - View all Lab Test Prescriptions
    - View Lab Test Prescriptions of a Patient
    - Mark Lab Test as Done
    - Enter Lab Test Result
  + A Patient can:
    - View his/her Details
    - View his/her Sickness Details
    - View his/her Drug Prescriptions
    - View his/her Lab Test Prescriptions

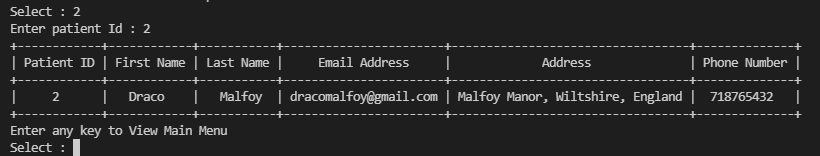
**Doctor functionalities**



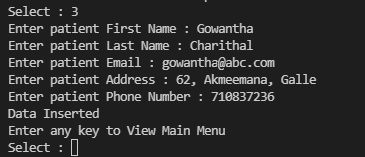
* View all Patients



* View a patient



* Register a Patient



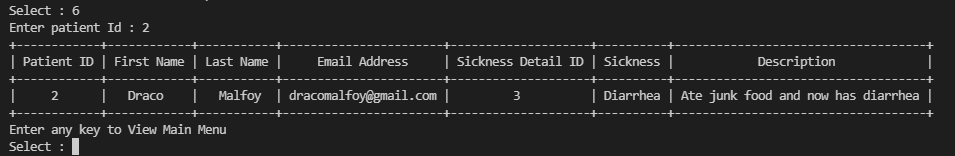
* Delete a Patient



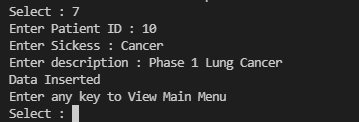
* View all Sickness Details



* View Sickness Details of a Patient



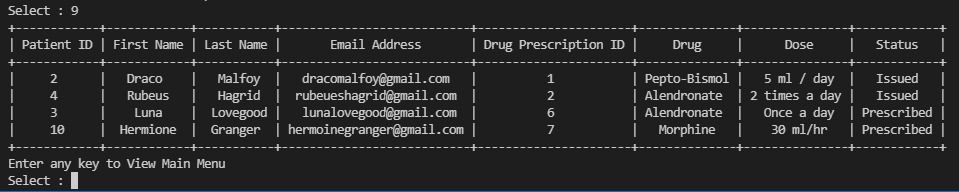
* Add Sickness Detail



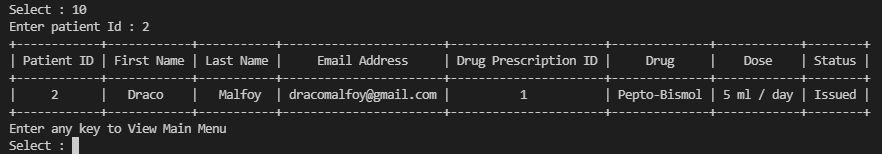
* Remove Sickness Detail



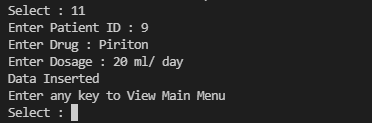
* View all Drug Prescriptions



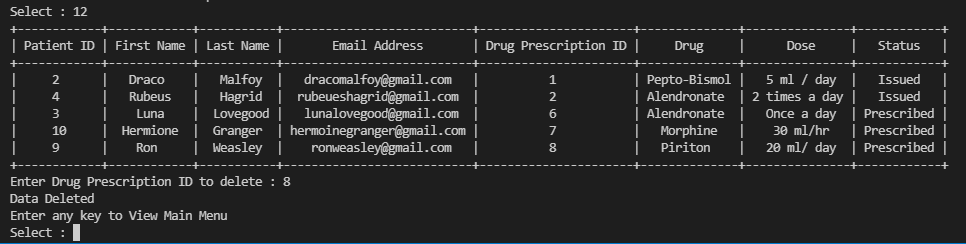
* View Drug Prescriptions of a Patient



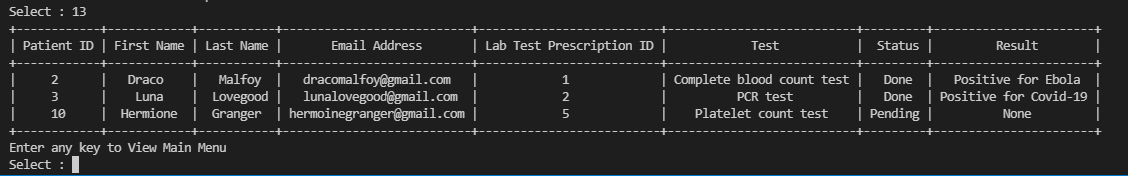
* Add Drug Prescription



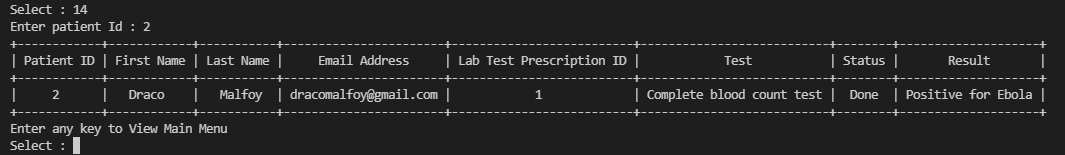
* Remove Drug Prescription



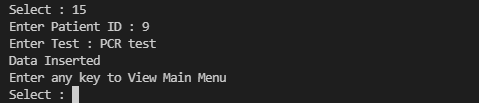
* View all Lab Test Prescriptions



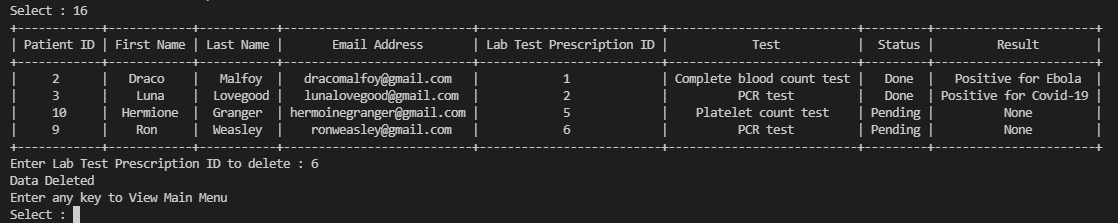
* View Lab Test Prescriptions of a Patient



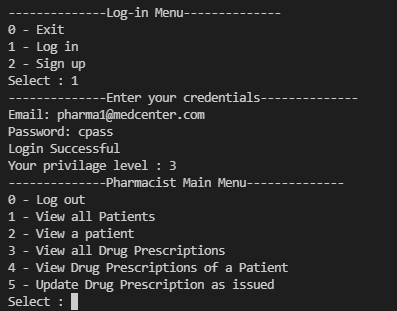
* Add Lab Test Prescription



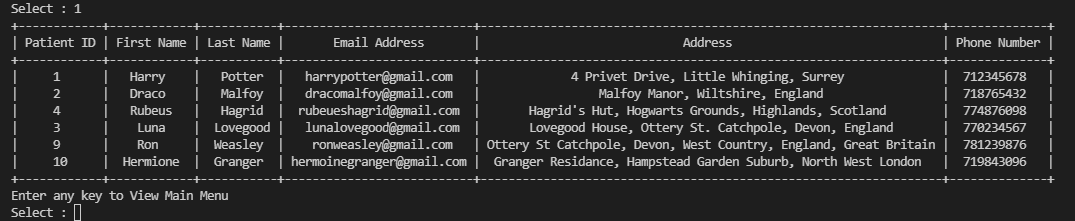
* Remove Lab Test Prescription



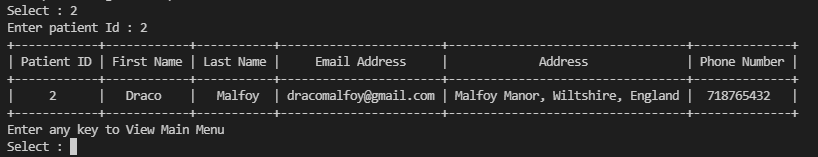
**Pharmacist functionalities**



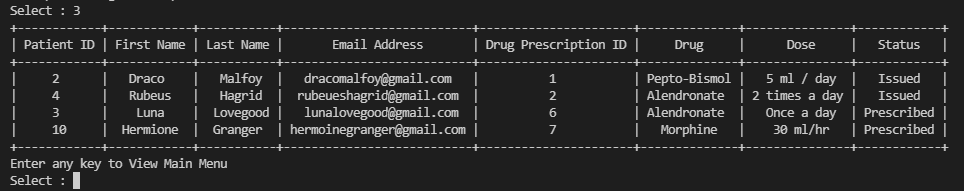
* View all Patients



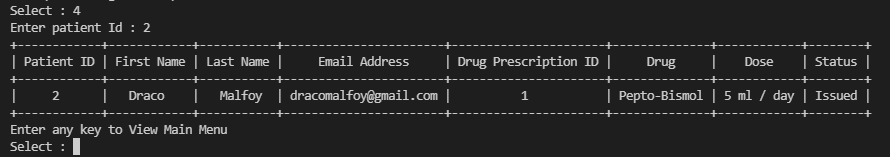
* View a patient



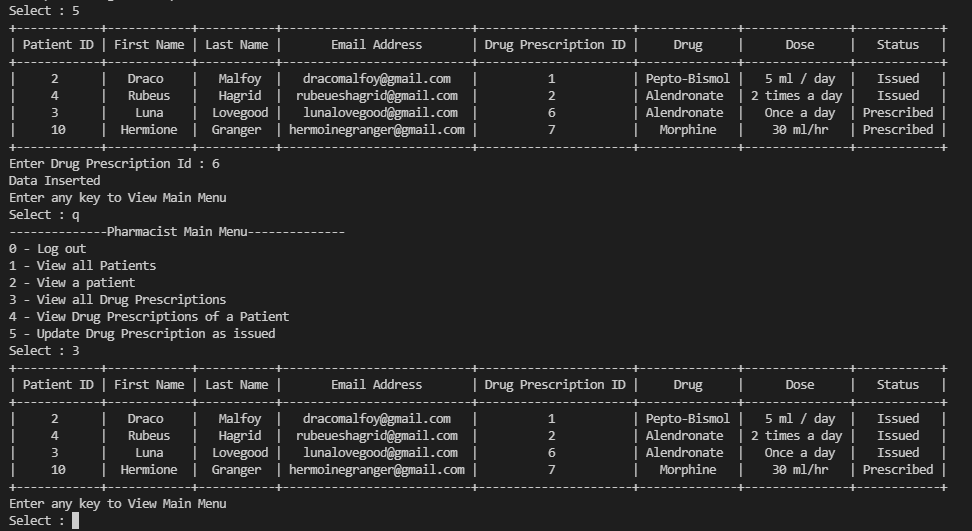
* View all Drug Prescriptions



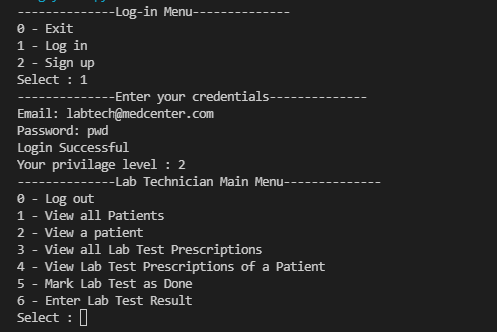
* View Drug Prescriptions of a Patient



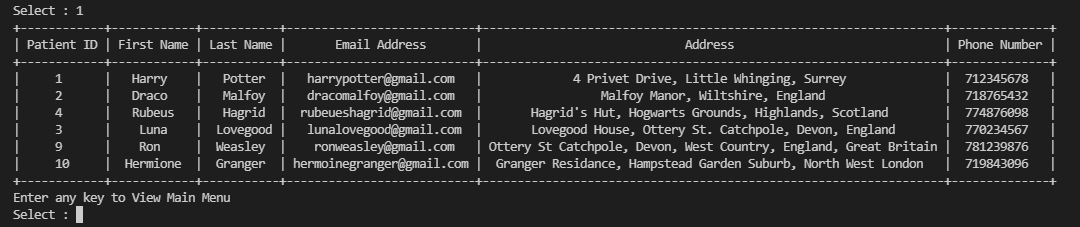
* Update Drug Prescription as issued



**Lab Technician functionalities**



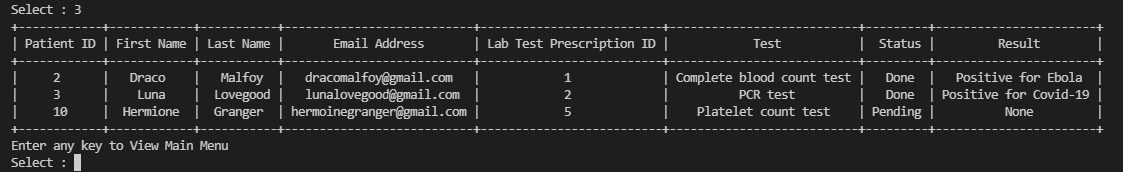
* View all Patients



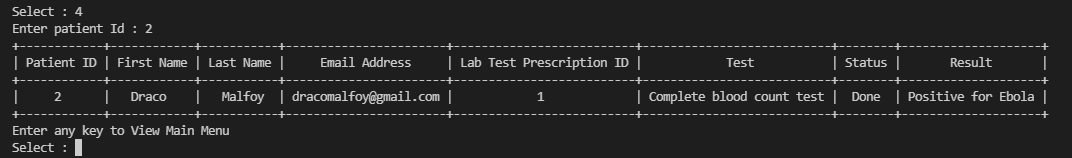
* View a patient



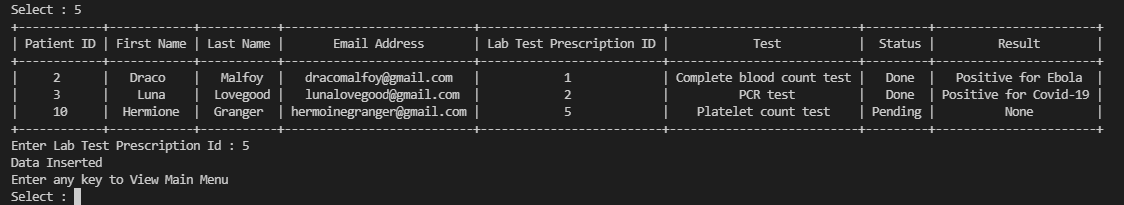
* View all Lab Test Prescriptions



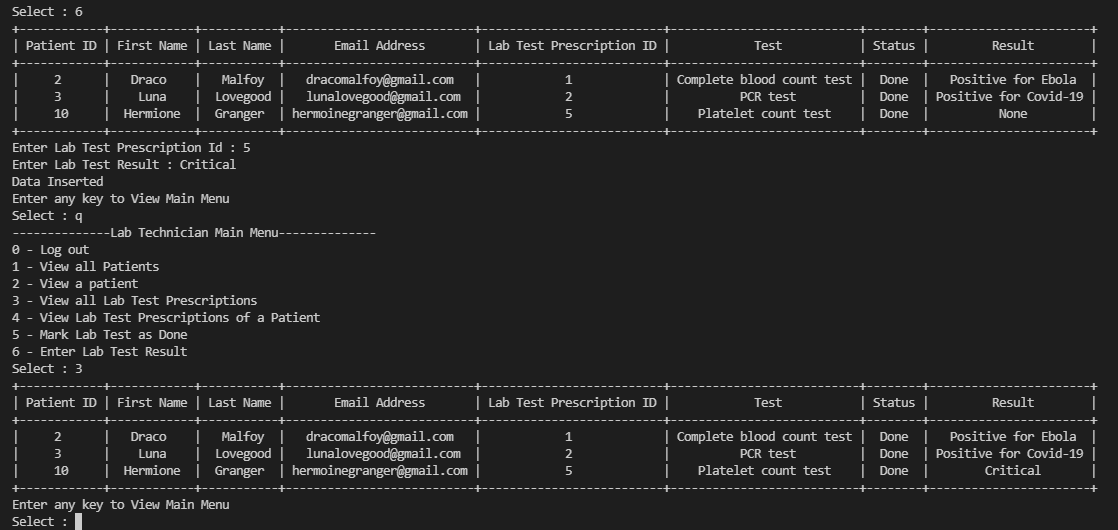
* View Lab Test Prescriptions of a Patient



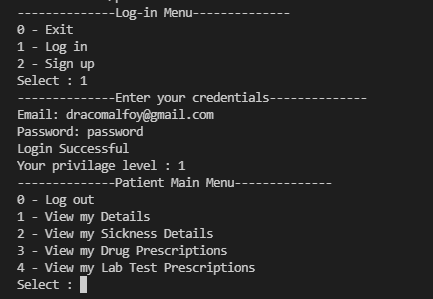
* Mark Lab Test as Done



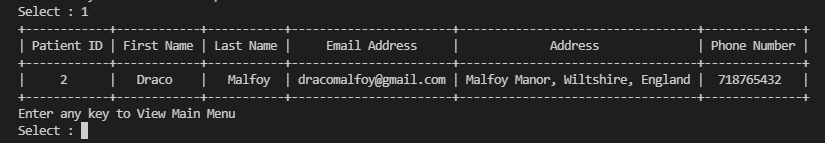
* Enter Lab Test Result



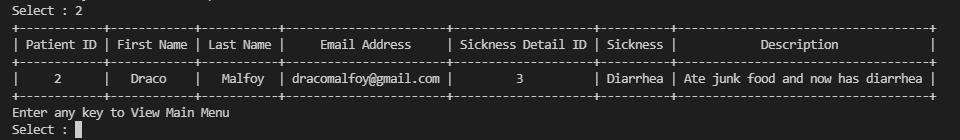
**Patient functionalities**



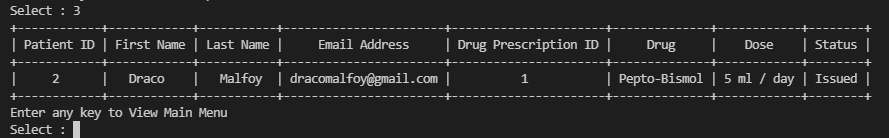
* View my Details



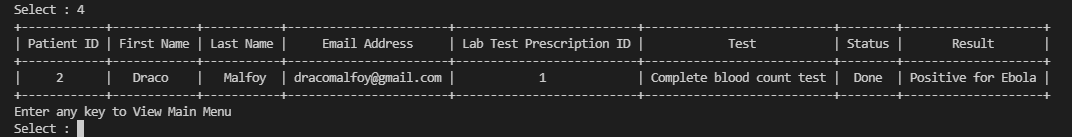
* View my Sickness Details



* View my Drug Prescriptions



* View my Lab Test Prescriptions



**Python Code for Medical Data Processing System**

medicalDataProcessingSystem.py

import pyodbc

import os

import hashlib

from prettytable import PrettyTable

#User class to save details of the current User

class User:

    def \_\_init\_\_(self, name, email, privilegeLvl):

        self.name = name

        self.email = email

        self.privilegeLvl = privilegeLvl

#login function

def login(email, pwd):

    #file read function

    configFile = open('config.txt', 'r')

    lines = configFile.readlines()

    configFile.close()

    count = 0

    login = False

    for line in lines:

        count += 1

        #seperate each data in a row

        data = line.strip().split(",")

        if(data[1] == email and data[2] == pwd.hexdigest()):

            login = True

            print("Login Successful")

            user = User(data[0], data[1], data[3])

            return user

    if(not login):

        print("Invalid email/password")

        return False

#--------------Database Dccess functions--------------

#Patient Database Access functions

def registerPatientDb(firstName, lastName, email, address, phoneNum):

    try:

        con\_str = r'DRIVER={Microsoft Access Driver (\*.mdb, \*.accdb)};DBQ='+os.path.dirname(os.path.abspath(\_\_file\_\_))+'\db\MedicalDataProcessingSystemDB.accdb;'

        conn = pyodbc.connect(con\_str)

        cursor = conn.cursor()

        myUser = (

            (firstName, lastName, email, address, phoneNum),

        )

        cursor.executemany('INSERT INTO Patient ([First Name], [Last Name], [Email Address], [Address], [Phone Number]) VALUES (?,?,?,?,?)', myUser)

        conn.commit()

        print('Data Inserted')

    except pyodbc.Error as e:

        print("Error in connection", e)

def deletePatientDb(patientId):

    try:

        con\_str = r'DRIVER={Microsoft Access Driver (\*.mdb, \*.accdb)};DBQ='+os.path.dirname(os.path.abspath(\_\_file\_\_))+'\db\MedicalDataProcessingSystemDB.accdb;'

        conn = pyodbc.connect(con\_str)

        cursor = conn.cursor()

        cursor.execute('DELETE FROM Patient WHERE Patient.[Patient ID] = ?', (patientId))

        conn.commit()

        print('Data Deleted')

    except pyodbc.Error as e:

        print("Error in connection", e)

def viewAllPatientsDb():

    try:

        con\_str = r'DRIVER={Microsoft Access Driver (\*.mdb, \*.accdb)};DBQ='+os.path.dirname(os.path.abspath(\_\_file\_\_))+'\db\MedicalDataProcessingSystemDB.accdb;'

        conn = pyodbc.connect(con\_str)

        cursor = conn.cursor()

        cursor.execute('SELECT \* FROM Patient')

        patients = []

        for row in cursor.fetchall():

            patients.append(row)

        return patients

    except pyodbc.Error as e:

        print("Error in connection", e)

def viewPatientDb(patientId):

    try:

        con\_str = r'DRIVER={Microsoft Access Driver (\*.mdb, \*.accdb)};DBQ='+os.path.dirname(os.path.abspath(\_\_file\_\_))+'\db\MedicalDataProcessingSystemDB.accdb;'

        conn = pyodbc.connect(con\_str)

        cursor = conn.cursor()

        cursor.execute('SELECT \* FROM Patient  WHERE [Patient].[Patient ID] = ?', (patientId))

        patients = []

        for row in cursor.fetchall():

            patients.append(row)

        return patients

    except pyodbc.Error as e:

        print("Error in connection", e)

def getMyIdDb(email):

    try:

        con\_str = r'DRIVER={Microsoft Access Driver (\*.mdb, \*.accdb)};DBQ='+os.path.dirname(os.path.abspath(\_\_file\_\_))+'\db\MedicalDataProcessingSystemDB.accdb;'

        conn = pyodbc.connect(con\_str)

        cursor = conn.cursor()

        cursor.execute('SELECT [Patient].[Patient ID] FROM Patient  WHERE [Patient].[Email Address] = ?', (email))

        myId = []

        for row in cursor.fetchall():

            myId.append(row)

        return myId

    except pyodbc.Error as e:

        print("Error in connection", e)

#Drug Prescription Database Access functions

def addDrugPrescriptionDb(patientId, drug, dose):

    try:

        con\_str = r'DRIVER={Microsoft Access Driver (\*.mdb, \*.accdb)};DBQ='+os.path.dirname(os.path.abspath(\_\_file\_\_))+'\db\MedicalDataProcessingSystemDB.accdb;'

        conn = pyodbc.connect(con\_str)

        cursor = conn.cursor()

        drugPrescriptionRecord = (

            (patientId, drug, dose, 'Prescribed'),

        )

        cursor.executemany('INSERT INTO [Drug Prescription] ([Patient ID], [Drug], [Dose], [Status]) VALUES (?,?,?,?)', drugPrescriptionRecord)

        conn.commit()

        print('Data Inserted')

    except pyodbc.Error as e:

        print("Error in connection", e)

def removeDrugPrescriptionDb(drugPrescriptionId):

    try:

        con\_str = r'DRIVER={Microsoft Access Driver (\*.mdb, \*.accdb)};DBQ='+os.path.dirname(os.path.abspath(\_\_file\_\_))+'\db\MedicalDataProcessingSystemDB.accdb;'

        conn = pyodbc.connect(con\_str)

        cursor = conn.cursor()

        cursor.execute('DELETE FROM [Drug Prescription] WHERE [Drug Prescription].[Drug Prescription ID] = ?', (drugPrescriptionId))

        conn.commit()

        print('Data Deleted')

    except pyodbc.Error as e:

        print("Error in connection", e)

def viewAllDrugPrescriptionsDb():

    try:

        con\_str = r'DRIVER={Microsoft Access Driver (\*.mdb, \*.accdb)};DBQ='+os.path.dirname(os.path.abspath(\_\_file\_\_))+'\db\MedicalDataProcessingSystemDB.accdb;'

        conn = pyodbc.connect(con\_str)

        cursor = conn.cursor()

        cursor.execute('SELECT Patient.[Patient ID], Patient.[First Name], Patient.[Last Name], Patient.[Email Address], [Drug Prescription].[Drug Prescription ID], [Drug Prescription].Drug, [Drug Prescription].Dose, [Drug Prescription].Status FROM Patient INNER JOIN [Drug Prescription] ON Patient.[Patient ID] = [Drug Prescription].[Patient ID];')

        drugPrescriptions = []

        for row in cursor.fetchall():

            drugPrescriptions.append(row)

        return drugPrescriptions

    except pyodbc.Error as e:

        print("Error in connection", e)

def viewPatientDrugPrescriptionsDb(patientId):

    try:

        con\_str = r'DRIVER={Microsoft Access Driver (\*.mdb, \*.accdb)};DBQ='+os.path.dirname(os.path.abspath(\_\_file\_\_))+'\db\MedicalDataProcessingSystemDB.accdb;'

        conn = pyodbc.connect(con\_str)

        cursor = conn.cursor()

        cursor.execute('SELECT Patient.[Patient ID], Patient.[First Name], Patient.[Last Name], Patient.[Email Address], [Drug Prescription].[Drug Prescription ID], [Drug Prescription].Drug, [Drug Prescription].Dose, [Drug Prescription].Status FROM Patient INNER JOIN [Drug Prescription] ON Patient.[Patient ID] = [Drug Prescription].[Patient ID] WHERE Patient.[Patient ID] = ?;', (patientId))

        drugPrescriptions = []

        for row in cursor.fetchall():

            drugPrescriptions.append(row)

        return drugPrescriptions

    except pyodbc.Error as e:

        print("Error in connection", e)

def isseDrugPrescriptionDb(drugPrescriptionId):

    try:

        con\_str = r'DRIVER={Microsoft Access Driver (\*.mdb, \*.accdb)};DBQ='+os.path.dirname(os.path.abspath(\_\_file\_\_))+'\db\MedicalDataProcessingSystemDB.accdb;'

        conn = pyodbc.connect(con\_str)

        cursor = conn.cursor()

        newStatus = 'Issued'

        cursor.execute('UPDATE [Drug Prescription]  SET [Drug Prescription].[Status] = ? WHERE [Drug Prescription].[Drug Prescription ID] = ?', (newStatus, drugPrescriptionId))

        conn.commit()

        print('Data Inserted')

    except pyodbc.Error as e:

        print("Error in connection", e)

#Lab Test Prescription Database Access functions

def addLabTestPrescriptionDb(patientId, test):

    try:

        con\_str = r'DRIVER={Microsoft Access Driver (\*.mdb, \*.accdb)};DBQ='+os.path.dirname(os.path.abspath(\_\_file\_\_))+'\db\MedicalDataProcessingSystemDB.accdb;'

        conn = pyodbc.connect(con\_str)

        cursor = conn.cursor()

        labTestPrescriptionRecord = (

            (patientId, test, 'Pending'),

        )

        cursor.executemany('INSERT INTO [Lab Test Prescription] ([Patient ID], [Test], [Status]) VALUES (?,?,?)', labTestPrescriptionRecord)

        conn.commit()

        print('Data Inserted')

    except pyodbc.Error as e:

        print("Error in connection", e)

def removeLabTestPrescriptionDb(labTestPrescriptionId):

    try:

        con\_str = r'DRIVER={Microsoft Access Driver (\*.mdb, \*.accdb)};DBQ='+os.path.dirname(os.path.abspath(\_\_file\_\_))+'\db\MedicalDataProcessingSystemDB.accdb;'

        conn = pyodbc.connect(con\_str)

        cursor = conn.cursor()

        cursor.execute('DELETE FROM [Lab Test Prescription] WHERE [Lab Test Prescription].[Lab Test Prescription ID] = ?', (labTestPrescriptionId))

        conn.commit()

        print('Data Deleted')

    except pyodbc.Error as e:

        print("Error in connection", e)

def viewAllLabTestPrescriptionsDb():

    try:

        con\_str = r'DRIVER={Microsoft Access Driver (\*.mdb, \*.accdb)};DBQ='+os.path.dirname(os.path.abspath(\_\_file\_\_))+'\db\MedicalDataProcessingSystemDB.accdb;'

        conn = pyodbc.connect(con\_str)

        cursor = conn.cursor()

        cursor.execute('SELECT Patient.[Patient ID], Patient.[First Name], Patient.[Last Name], Patient.[Email Address], [Lab Test Prescription].[Lab Test Prescription ID], [Lab Test Prescription].Test, [Lab Test Prescription].Status, [Lab Test Prescription].Result FROM Patient INNER JOIN [Lab Test Prescription] ON Patient.[Patient ID] = [Lab Test Prescription].[Patient ID];')

        labTestPrescriptions = []

        for row in cursor.fetchall():

            labTestPrescriptions.append(row)

        return labTestPrescriptions

    except pyodbc.Error as e:

        print("Error in connection", e)

def viewPatientLabTestPrescriptionsDb(patientId):

    try:

        con\_str = r'DRIVER={Microsoft Access Driver (\*.mdb, \*.accdb)};DBQ='+os.path.dirname(os.path.abspath(\_\_file\_\_))+'\db\MedicalDataProcessingSystemDB.accdb;'

        conn = pyodbc.connect(con\_str)

        cursor = conn.cursor()

        cursor.execute('SELECT Patient.[Patient ID], Patient.[First Name], Patient.[Last Name], Patient.[Email Address], [Lab Test Prescription].[Lab Test Prescription ID], [Lab Test Prescription].Test, [Lab Test Prescription].Status, [Lab Test Prescription].Result FROM Patient INNER JOIN [Lab Test Prescription] ON Patient.[Patient ID] = [Lab Test Prescription].[Patient ID] WHERE Patient.[Patient ID] = ?;', (patientId))

        labTestPrescriptions = []

        for row in cursor.fetchall():

            labTestPrescriptions.append(row)

        return labTestPrescriptions

    except pyodbc.Error as e:

        print("Error in connection", e)

def labTestPrescriptionMarkDoneDb(labTestPrescriptionId):

    try:

        con\_str = r'DRIVER={Microsoft Access Driver (\*.mdb, \*.accdb)};DBQ='+os.path.dirname(os.path.abspath(\_\_file\_\_))+'\db\MedicalDataProcessingSystemDB.accdb;'

        conn = pyodbc.connect(con\_str)

        cursor = conn.cursor()

        newStatus = 'Done'

        cursor.execute('UPDATE [Lab Test Prescription]  SET [Lab Test Prescription].[Status] = ? WHERE [Lab Test Prescription].[Lab Test Prescription ID] = ?', (newStatus, labTestPrescriptionId))

        conn.commit()

        print('Data Inserted')

    except pyodbc.Error as e:

        print("Error in connection", e)

def addLabTestPrescriptionResultDb(labTestPrescriptionId, result):

    try:

        con\_str = r'DRIVER={Microsoft Access Driver (\*.mdb, \*.accdb)};DBQ='+os.path.dirname(os.path.abspath(\_\_file\_\_))+'\db\MedicalDataProcessingSystemDB.accdb;'

        conn = pyodbc.connect(con\_str)

        cursor = conn.cursor()

        cursor.execute('UPDATE [Lab Test Prescription]  SET [Lab Test Prescription].[Result] = ? WHERE [Lab Test Prescription].[Lab Test Prescription ID] = ?', (result, labTestPrescriptionId))

        conn.commit()

        print('Data Inserted')

    except pyodbc.Error as e:

        print("Error in connection", e)

#Sickness Detail Database Access functions

def addSicknessDetailDb(patientId, sickness, description):

    try:

        con\_str = r'DRIVER={Microsoft Access Driver (\*.mdb, \*.accdb)};DBQ='+os.path.dirname(os.path.abspath(\_\_file\_\_))+'\db\MedicalDataProcessingSystemDB.accdb;'

        conn = pyodbc.connect(con\_str)

        cursor = conn.cursor()

        sicknessDetailRecord = (

            (patientId, sickness, description),

        )

        cursor.executemany('INSERT INTO [Sickness Detail] ([Patient ID], [Sickness], [Description]) VALUES (?,?,?)', sicknessDetailRecord)

        conn.commit()

        print('Data Inserted')

    except pyodbc.Error as e:

        print("Error in connection", e)

def removeSicknessDetailDb(sicknessDetailId):

    try:

        con\_str = r'DRIVER={Microsoft Access Driver (\*.mdb, \*.accdb)};DBQ='+os.path.dirname(os.path.abspath(\_\_file\_\_))+'\db\MedicalDataProcessingSystemDB.accdb;'

        conn = pyodbc.connect(con\_str)

        cursor = conn.cursor()

        cursor.execute('DELETE FROM [Sickness Detail] WHERE [Sickness Detail].[Sickness Detail ID] = ?', (sicknessDetailId))

        conn.commit()

        print('Data Deleted')

    except pyodbc.Error as e:

        print("Error in connection", e)

def viewAllSicknessDetailsDb():

    try:

        con\_str = r'DRIVER={Microsoft Access Driver (\*.mdb, \*.accdb)};DBQ='+os.path.dirname(os.path.abspath(\_\_file\_\_))+'\db\MedicalDataProcessingSystemDB.accdb;'

        conn = pyodbc.connect(con\_str)

        cursor = conn.cursor()

        cursor.execute('SELECT Patient.[Patient ID], Patient.[First Name], Patient.[Last Name], Patient.[Email Address], [Sickness Detail].[Sickness Detail ID], [Sickness Detail].Sickness, [Sickness Detail].Description FROM Patient INNER JOIN [Sickness Detail] ON Patient.[Patient ID] = [Sickness Detail].[Patient ID];')

        sicknessDetails = []

        for row in cursor.fetchall():

            sicknessDetails.append(row)

        return sicknessDetails

    except pyodbc.Error as e:

        print("Error in connection", e)

def viewPatientSicknessDetailsDb(patientId):

    try:

        con\_str = r'DRIVER={Microsoft Access Driver (\*.mdb, \*.accdb)};DBQ='+os.path.dirname(os.path.abspath(\_\_file\_\_))+'\db\MedicalDataProcessingSystemDB.accdb;'

        conn = pyodbc.connect(con\_str)

        cursor = conn.cursor()

        cursor.execute('SELECT Patient.[Patient ID], Patient.[First Name], Patient.[Last Name], Patient.[Email Address], [Sickness Detail].[Sickness Detail ID], [Sickness Detail].Sickness, [Sickness Detail].Description FROM Patient INNER JOIN [Sickness Detail] ON Patient.[Patient ID] = [Sickness Detail].[Patient ID] WHERE Patient.[Patient ID] = ?;', (patientId))

        sicknessDetails = []

        for row in cursor.fetchall():

            sicknessDetails.append(row)

        return sicknessDetails

    except pyodbc.Error as e:

        print("Error in connection", e)

#--------------Data Functions--------------

#Patient Data functions

#function to register a patient

def registerPatient(firstName, lastName, email, address, phoneNum):

    registerPatientDb(firstName, lastName, email, address, phoneNum)

#function to delete a patient

def deletePatient(patientId):

    deletePatientDb(patientId)

#function to view all patients

def viewAllPatients():

    rows = viewAllPatientsDb()

    table = PrettyTable(["Patient ID", "First Name", "Last Name", "Email Address", "Address", "Phone Number"])

    for row in rows:

              table.add\_row([row[0],row[1],row[2],row[3],row[4],row[5]])

    print(table)

#function to a single patient

def viewPatient(patientId):

    rows = viewPatientDb(patientId)

    table = PrettyTable(["Patient ID", "First Name", "Last Name", "Email Address", "Address", "Phone Number"])

    for row in rows:

              table.add\_row([row[0],row[1],row[2],row[3],row[4],row[5]])

    print(table)

#get the patient id for an email

def getMyId(email):

    myId = getMyIdDb(email)

    try:

        return myId[0][0]

    except:

        return None

#Drug Prescription Data functions

#function to add a drug presciption

def addDrugPrescription(patientId, drug, dose):

    addDrugPrescriptionDb(patientId, drug, dose)

#function to remove a drug presciption

def removeDrugPrescription(drugPrescriptionId):

    removeDrugPrescriptionDb(drugPrescriptionId)

#function to view all drug presciptions

def viewAllDrugPrescriptions():

    rows = viewAllDrugPrescriptionsDb()

    table = PrettyTable(["Patient ID", "First Name", "Last Name", "Email Address", "Drug Prescription ID", "Drug", "Dose", "Status"])

    for row in rows:

              table.add\_row([row[0], row[1], row[2], row[3], row[4], row[5], row[6], row[7]])

    print(table)

#function to view all drug presciptions of a patient

def viewPatientDrugPrescriptions(patientId):

    rows = viewPatientDrugPrescriptionsDb(patientId)

    table = PrettyTable(["Patient ID", "First Name", "Last Name", "Email Address", "Drug Prescription ID", "Drug", "Dose", "Status"])

    for row in rows:

              table.add\_row([row[0], row[1], row[2], row[3], row[4], row[5], row[6], row[7]])

    print(table)

#function to change the state of a drug presciption record from Prescribed to Issued

def isseDrugPrescription(drugPrescriptionId):

    isseDrugPrescriptionDb(drugPrescriptionId)

#Lab Test Prescription Data functions

#function to add a lab test presciption

def addLabTestPrescription(patientId, test):

    addLabTestPrescriptionDb(patientId, test)

#function to remove a lab test presciption

def removeLabTestPrescription(labTestPrescriptionId):

    removeLabTestPrescriptionDb(labTestPrescriptionId)

#function to view all lab test presciptions

def viewAllLabTestPrescriptions():

    rows = viewAllLabTestPrescriptionsDb()

    table = PrettyTable(["Patient ID", "First Name", "Last Name", "Email Address", "Lab Test Prescription ID", "Test", "Status", "Result"])

    for row in rows:

              table.add\_row([row[0], row[1], row[2], row[3], row[4], row[5], row[6], row[7]])

    print(table)

#function to view all lab test presciptions of a patient

def viewPatientLabTestPrescriptions(patientId):

    rows = viewPatientLabTestPrescriptionsDb(patientId)

    table = PrettyTable(["Patient ID", "First Name", "Last Name", "Email Address", "Lab Test Prescription ID", "Test", "Status", "Result"])

    for row in rows:

              table.add\_row([row[0], row[1], row[2], row[3], row[4], row[5], row[6], row[7]])

    print(table)

#function to change the state of a lab test presciption record from Pending to Done

def labTestPrescriptionMarkDone(labTestPrescriptionId):

    labTestPrescriptionMarkDoneDb(labTestPrescriptionId)

#function to add the result of a lab test presciption

def addLabTestPrescriptionResult(labTestPrescriptionId, result):

    addLabTestPrescriptionResultDb(labTestPrescriptionId, result)

#Sickness Detail Data functions

#function to add a sickness detail

def addSicknessDetail(patientId, sickness, description):

    addSicknessDetailDb(patientId, sickness, description)

#function to remove a sickness detail

def removeSicknessDetail(sicknessDetailId):

    removeSicknessDetailDb(sicknessDetailId)

#function to view all sickness details

def viewAllSicknessDetails():

    rows = viewAllSicknessDetailsDb()

    table = PrettyTable(["Patient ID", "First Name", "Last Name", "Email Address", "Sickness Detail ID", "Sickness", "Description"])

    for row in rows:

              table.add\_row([row[0], row[1], row[2], row[3], row[4], row[5], row[6]])

    print(table)

#function to view all sickness details of a patient

def viewPatientSicknessDetails(patientId):

    rows = viewPatientSicknessDetailsDb(patientId)

    table = PrettyTable(["Patient ID", "First Name", "Last Name", "Email Address", "Sickness Detail ID", "Sickness", "Description"])

    for row in rows:

              table.add\_row([row[0], row[1], row[2], row[3], row[4], row[5], row[6]])

    print(table)

#--------------Program--------------

while(True):

    #Log-in interface

    print("--------------Log-in Menu--------------")

    print("0 - Exit")

    print("1 - Log in")

    print("2 - Sign up")

    select = input("Select : ")

    if(select == "0"):

        break

    #Log in as an existing user

    elif(select == "1"):

        print("--------------Enter your credentials--------------")

        email = input("Email: ")

        password = input("Password: ")

        #   hash the password with md5

        hashed\_pw = hashlib.md5(password.encode())

        user = login(email,hashed\_pw)

        if(user): # check whether the login is success

            print('Your privilage level :',user.privilegeLvl)

            loggedIn = True

            while(loggedIn):

                #--------------if the user is a Doctor--------------

                if (user.privilegeLvl == '4'):

                    #Doctor Main Menu

                    print("--------------Doctor Main Menu--------------")

                    print("0 - Log out")

                    print("1 - View all Patients")

                    print("2 - View a patient")

                    print("3 - Register a Patient")

                    print("4 - Delete a Patient")

                    print("5 - View all Sickness Details")

                    print("6 - View  Sickness Details of a Patient")

                    print("7 - Add Sickness Detail")

                    print("8 - Remove Sickness Detail")

                    print("9 - View all Drug Prescriptions")

                    print("10 - View Drug Prescriptions of a Patient")

                    print("11 - Add Drug Prescription")

                    print("12 - Remove Drug Prescription")

                    print("13 - View all Lab Test Prescriptions")

                    print("14 - View Lab Test Prescriptions of a Patient")

                    print("15 - Add Lab Test Prescription")

                    print("16 - Remove Lab Test Prescription")

                    select2 = input("Select : ")

                    if(select2 == "0"):

                        loggedIn = False

                        continue

                    elif(select2 == "1"):

                        viewAllPatients()

                        print("Enter any key to View Main Menu")

                        select3 = input("Select : ")

                        continue

                    elif(select2 == "2"):

                        patientId = int(input("Enter patient Id : "))

                        viewPatient(patientId)

                        print("Enter any key to View Main Menu")

                        select3 = input("Select : ")

                        continue

                    elif(select2 == "3"):

                        firstName = input("Enter patient First Name : ")

                        lastName = input("Enter patient Last Name : ")

                        email = input("Enter patient Email : ")

                        address = input("Enter patient Address : ")

                        phoneNum = int(input("Enter patient Phone Number : "))

                        registerPatient(firstName, lastName, email, address, phoneNum)

                        print("Enter any key to View Main Menu")

                        select3 = input("Select : ")

                        continue

                    elif(select2 == "4"):

                        viewAllPatients()

                        patientId = int(input("Enter Patient ID to delete : "))

                        deletePatient(patientId)

                        print("Enter any key to View Main Menu")

                        select3 = input("Select : ")

                        continue

                    elif(select2 == "5"):

                        viewAllSicknessDetails()

                        print("Enter any key to View Main Menu")

                        select3 = input("Select : ")

                        continue

                    elif(select2 == "6"):

                        patientId = int(input("Enter patient Id : "))

                        viewPatientSicknessDetails(patientId)

                        print("Enter any key to View Main Menu")

                        select3 = input("Select : ")

                        continue

                    elif(select2 == "7"):

                        patientId = int(input("Enter Patient ID : "))

                        sickness = input("Enter Sickess : ")

                        description = input("Enter description : ")

                        addSicknessDetail(patientId, sickness, description)

                        print("Enter any key to View Main Menu")

                        select3 = input("Select : ")

                        continue

                    elif(select2 == "8"):

                        viewAllSicknessDetails()

                        sicknessDetailId = int(input("Enter Sickness Detail ID to delete : "))

                        removeSicknessDetail(sicknessDetailId)

                        print("Enter any key to View Main Menu")

                        select3 = input("Select : ")

                        continue

                    elif(select2 == "9"):

                        viewAllDrugPrescriptions()

                        print("Enter any key to View Main Menu")

                        select3 = input("Select : ")

                        continue

                    elif(select2 == "10"):

                        patientId = int(input("Enter patient Id : "))

                        viewPatientDrugPrescriptions(patientId)

                        print("Enter any key to View Main Menu")

                        select3 = input("Select : ")

                        continue

                    elif(select2 == "11"):

                        patientId = int(input("Enter Patient ID : "))

                        drug = input("Enter Drug : ")

                        dose = input("Enter Dosage : ")

                        addDrugPrescription(patientId, drug, dose)

                        print("Enter any key to View Main Menu")

                        select3 = input("Select : ")

                        continue

                    elif(select2 == "12"):

                        viewAllDrugPrescriptions()

                        drugPrescriptionId = int(input("Enter Drug Prescription ID to delete : "))

                        removeDrugPrescription(drugPrescriptionId)

                        print("Enter any key to View Main Menu")

                        select3 = input("Select : ")

                        continue

                    elif(select2 == "13"):

                        viewAllLabTestPrescriptions()

                        print("Enter any key to View Main Menu")

                        select3 = input("Select : ")

                        continue

                    elif(select2 == "14"):

                        patientId = int(input("Enter patient Id : "))

                        viewPatientLabTestPrescriptions(patientId)

                        print("Enter any key to View Main Menu")

                        select3 = input("Select : ")

                        continue

                    elif(select2 == "15"):

                        patientId = int(input("Enter Patient ID : "))

                        test = input("Enter Test : ")

                        addLabTestPrescription(patientId, test)

                        print("Enter any key to View Main Menu")

                        select3 = input("Select : ")

                        continue

                    elif(select2 == "16"):

                        viewAllLabTestPrescriptions()

                        labTestPrescriptionId = int(input("Enter Lab Test Prescription ID to delete : "))

                        removeLabTestPrescription(labTestPrescriptionId)

                        print("Enter any key to View Main Menu")

                        select3 = input("Select : ")

                        continue

                #--------------if the user is a Pharmacist--------------

                elif (user.privilegeLvl == '3'):

                    #Pharmacist Main Menu

                    print("--------------Pharmacist Main Menu--------------")

                    print("0 - Log out")

                    print("1 - View all Patients")

                    print("2 - View a patient")

                    print("3 - View all Drug Prescriptions")

                    print("4 - View Drug Prescriptions of a Patient")

                    print("5 - Update Drug Prescription as issued")

                    select2 = input("Select : ")

                    if(select2 == "0"):

                        loggedIn = False

                        continue

                    elif(select2 == "1"):

                        viewAllPatients()

                        print("Enter any key to View Main Menu")

                        select3 = input("Select : ")

                        continue

                    elif(select2 == "2"):

                        patientId = int(input("Enter patient Id : "))

                        viewPatient(patientId)

                        print("Enter any key to View Main Menu")

                        select3 = input("Select : ")

                        continue

                    elif(select2 == "3"):

                        viewAllDrugPrescriptions()

                        print("Enter any key to View Main Menu")

                        select3 = input("Select : ")

                        continue

                    elif(select2 == "4"):

                        patientId = int(input("Enter patient Id : "))

                        viewPatientDrugPrescriptions(patientId)

                        print("Enter any key to View Main Menu")

                        select3 = input("Select : ")

                        continue

                    elif(select2 == "5"):

                        viewAllDrugPrescriptions()

                        drugPrescriptionId = int(input("Enter Drug Prescription Id : "))

                        isseDrugPrescription(drugPrescriptionId)

                        print("Enter any key to View Main Menu")

                        select3 = input("Select : ")

                        continue

                #--------------if the user is a Lab Technician--------------

                elif (user.privilegeLvl == '2'):

                    #Lab Technician Main Menu

                    print("--------------Lab Technician Main Menu--------------")

                    print("0 - Log out")

                    print("1 - View all Patients")

                    print("2 - View a patient")

                    print("3 - View all Lab Test Prescriptions")

                    print("4 - View Lab Test Prescriptions of a Patient")

                    print("5 - Mark Lab Test as Done")

                    print("6 - Enter Lab Test Result")

                    select2 = input("Select : ")

                    if(select2 == "0"):

                        loggedIn = False

                        continue

                    elif(select2 == "1"):

                        viewAllPatients()

                        print("Enter any key to View Main Menu")

                        select3 = input("Select : ")

                        continue

                    elif(select2 == "2"):

                        patientId = int(input("Enter patient Id : "))

                        viewPatient(patientId)

                        print("Enter any key to View Main Menu")

                        select3 = input("Select : ")

                        continue

                    elif(select2 == "3"):

                        viewAllLabTestPrescriptions()

                        print("Enter any key to View Main Menu")

                        select3 = input("Select : ")

                        continue

                    elif(select2 == "4"):

                        patientId = int(input("Enter patient Id : "))

                        viewPatientLabTestPrescriptions(patientId)

                        print("Enter any key to View Main Menu")

                        select3 = input("Select : ")

                        continue

                    elif(select2 == "5"):

                        viewAllLabTestPrescriptions()

                        labTestPrescriptionId = int(input("Enter Lab Test Prescription Id : "))

                        labTestPrescriptionMarkDone(labTestPrescriptionId)

                        print("Enter any key to View Main Menu")

                        select3 = input("Select : ")

                        continue

                    elif(select2 == "6"):

                        viewAllLabTestPrescriptions()

                        labTestPrescriptionId = int(input("Enter Lab Test Prescription Id : "))

                        result = input("Enter Lab Test Result : ")

                        addLabTestPrescriptionResult(labTestPrescriptionId, result)

                        print("Enter any key to View Main Menu")

                        select3 = input("Select : ")

                        continue

                #--------------if the user is a Patient--------------

                elif (user.privilegeLvl == '1'):

                    myId = getMyId(user.email)

                    if myId == None:

                        print("Couldn't find any patient records for the email", user.email)

                        break

                    #Patient Main Menu

                    print("--------------Patient Main Menu--------------")

                    print("0 - Log out")

                    print("1 - View my Details")

                    print("2 - View my Sickness Details")

                    print("3 - View my Drug Prescriptions")

                    print("4 - View my Lab Test Prescriptions")

                    select2 = input("Select : ")

                    if(select2 == "0"):

                        loggedIn = False

                        continue

                    elif(select2 == "1"):

                        viewPatient(myId)

                        print("Enter any key to View Main Menu")

                        select3 = input("Select : ")

                        continue

                    elif(select2 == "2"):

                        viewPatientSicknessDetails(myId)

                        print("Enter any key to View Main Menu")

                        select3 = input("Select : ")

                        continue

                    elif(select2 == "3"):

                        viewPatientDrugPrescriptions(myId)

                        print("Enter any key to View Main Menu")

                        select3 = input("Select : ")

                        continue

                    elif(select2 == "4"):

                        viewPatientLabTestPrescriptions(myId)

                        print("Enter any key to View Main Menu")

                        select3 = input("Select : ")

                        continue

    #Register a new User

    elif(select == "2"):

        #User Sign-up interface

        print("--------------New User Sign-up--------------")

        print("1 - Patient Sign-up")

        print("2 - Lab Technician Sign-up")

        print("3 - Pharmacist Sign-up")

        print("4 - Doctor Sign-up")

        #select the type of user

        select2 = input("Select : ")

        if (select2 == '1'):

            privilegeLvl = 1

        elif (select2 == '2'):

            privilegeLvl = 2

        elif (select2 == '3'):

            privilegeLvl = 3

        elif (select2 == '4'):

            privilegeLvl = 4

        name = input("Enter Name : ")

        email = input("Enter Email : ")

        password = input("Enter Password : ")

        hashed\_password = hashlib.md5(password.encode())

        #write the user credentials into the config.txt file

        f = open("config.txt", "a")

        userRecord = name + "," + email + "," + hashed\_password.hexdigest() +"," + str(privilegeLvl)

        f.write(userRecord)

        f.write("\n")

        f.close()

        print("User Registered")

        print("Now you can log in using the credentials")

**Annexes**

**config.txt**

Dr Dakshitha,doctor1@medcenter.com,5f4dcc3b5aa765d61d8327deb882cf99,4

Draco Malfoy,dracomalfoy@gmail.com,5f4dcc3b5aa765d61d8327deb882cf99,1

Geeth,labtech@medcenter.com,9003d1df22eb4d3820015070385194c8,2

Charuka Rathnayaka,pharma1@medcenter.com,827d043606ac6fb18e465b87ffa05e89,3

Harry Potter,harrypotter@gmail.com,899b172c0a47c4139407bb89b8205436,1

Luna Lovegood,lunalovegood@gmail.com,f8bf9e5b72e3d4e017d483787baa3d4b,1

Rubeus Hagrid,rubeueshagrid@gmail.com,74b91298945992e3a5760e7885686e4a,1

Ruchika Dilith,doctor2@gmail.com,74b91298945992e3a5760e7885686e4a,4

Nuvindu Nirmana,labtech2@medcenter.com,b5997cee0d1ef3e5f3f6dc7a8b3ad7d7,2

Mahesh Jayawardana,prama2@medcenter.com,fc695527ce186f3a87ac588d9cc8339d,3