CS 350 – DATABASE SYSTEMS
TERM PROJECT
PART 3: Design and Implementation

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1. Motivation and Requirements:

- This application allows people who need blood to easily find blood in Istanbul.
- The system has a lot of donors, when the application is run, the person who needs the blood is registered and at the same time the needed blood can be searched. However, the analysis results of the blood taken can be viewed from the system.

2. Conceptual Database Design

- In my project, I need patient who need blood and donor who denote blood and blood center to exchange blood. For analysis of blood I use random method to create values.
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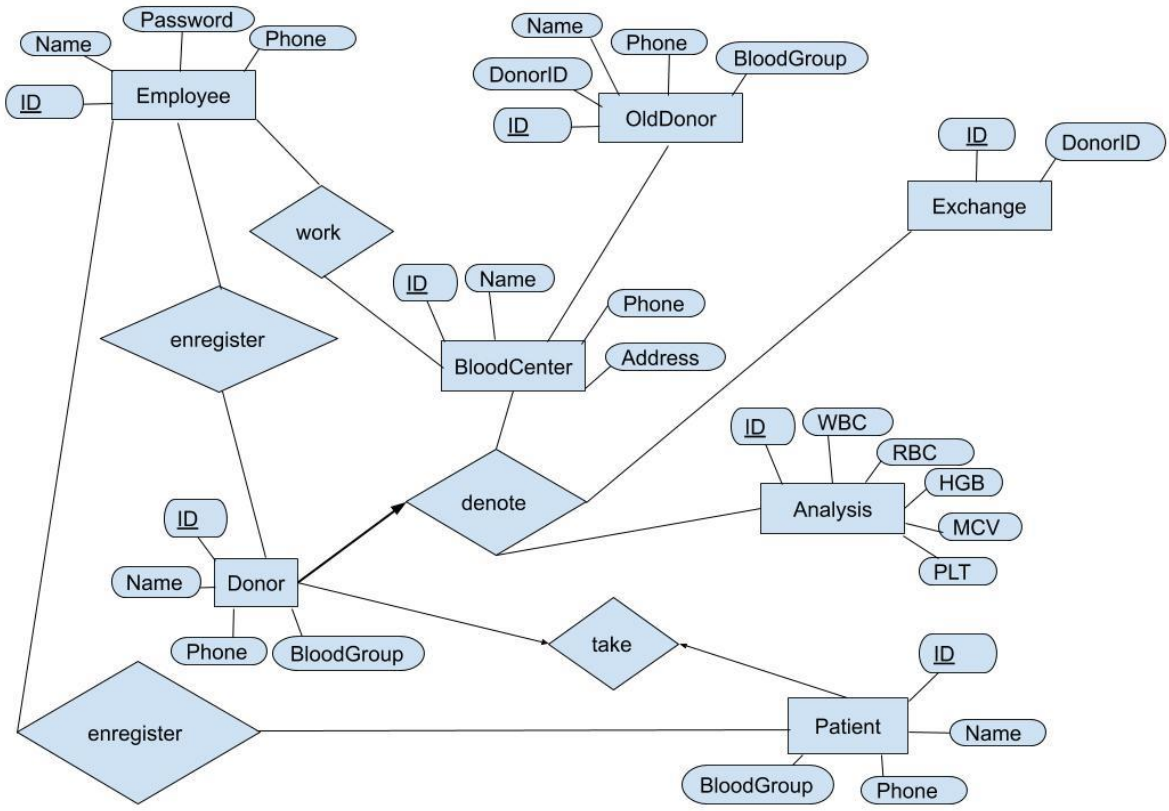

3. Logical Database Design

- **Tables**

```
CREATE TABLE BloodCenter ( CenterID FLOAT,
        CenterName NCHAR(150),
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```
    CenterPhone NCHAR(20),
    CenterAddress NCHAR(150),
    PRIMARY KEY (CenterID))

CREATE TABLE Donor ( DonorID FLOAT,
    DonorName NVARCHAR(255),
    DonorPhone FLOAT,
    DonorBloodGroup NVARCHAR(255),
    CenterID FLOAT,
    PRIMARY KEY (DonorID),
    FOREIGN KEY (CenterID) REFERENCES BloodCenter)

CREATE TABLE Patient ( PatientID FLOAT,
    PatientName NCHAR(30),
    PatientPhone FLOAT,
    PatientBloodGroup NCHAR(5),
    PRIMARY KEY (PatientID))

CREATE TABLE Employee ( EmployeeID FLOAT,
    EmployeeName NCHAR(30),
    EmployeePassword NCHAR(20),
    EmployeePhone FLOAT,
    CenterID FLOAT,
    PRIMARY KEY (EmployeeID),
    FOREIGN KEY (CenterID) REFERENCES BloodCenter)

CREATE TABLE OldDonor ( ID NUMERIC (18,0),
    DonorID FLOAT,
    DonorName NCHAR(30),
    DonorPhone FLOAT,
    DonorBloodGroup NCHAR(5),
    CenterID FLOAT,
    PRIMARY KEY (ID),
    FOREIGN KEY (CenterID) REFERENCES BloodCenter)


CREATE TABLE Exchange ( ExchangeID NUMERIC(18,0),
    PatientID FLOAT,
    DonorID FLOAT,
    CenterID FLOAT,
    EmployeeID FLOAT,
    PRIMARY KEY (ExchangeID),
    FOREIGN KEY (PatientID) REFERENCES Patient,
    FOREIGN KEY (CenterID) REFERENCES BloodCenter,
    FOREIGN KEY (EmployeeID) REFERENCES Employee)
```

```
CREATE TABLE Analysis ( AnalysisID NUMERIC(18,0),
        ExchangeID NUMERIC(18,0),
        WBC NCHAR (10),
        RBC NCHAR (10),
        HGB NCHAR (10),
        MCV NCHAR (10),
        PLT NCHAR (10),
        PRIMARY KEY (AnalysisID),
        FOREIGN KEY (ExchangeID) REFERENCES Exchange)
```

- **Functional Dependencies**
  1. CenterID ⟶ CenterName, CenterAddress, CenterPhone
  2. CenterName, CenterAddress ⟶ CenterID
  3. PatientID ⟶ PatientName, PatientPhone,PatientBloodGroup
  4. PatientName, PatientPhone ⟶ PatientID
  5. DonorID⟶ DonorName, DonorPhone, DonorBloodGroup, CenterID
  6. DonorName, DonorPhone ⟶ DonorBloodGroup
  7. DonorName, DonorPhone, DonorBloodGroup ⟶ DonorID
  8. EmployeeID ⟶ EmployeeName, EmployeePhone, CenterID
  9. EmployeeName, EmployeePhone ⟶ EmployeeID
  10. ExchangeID ⟶ PatientID, DonorID, CenterID
  11. AnalysisID ⟶ ExchangeID, WBC, RBC, HGB, MVC, PLT

- **Normalization**

1- It is in BCNF because it has primary and candidate key.

3- It is in BCNF because of having primary and candidate key.

5- There are primary and candidate key that refers CenterID, so it is in BCNF.

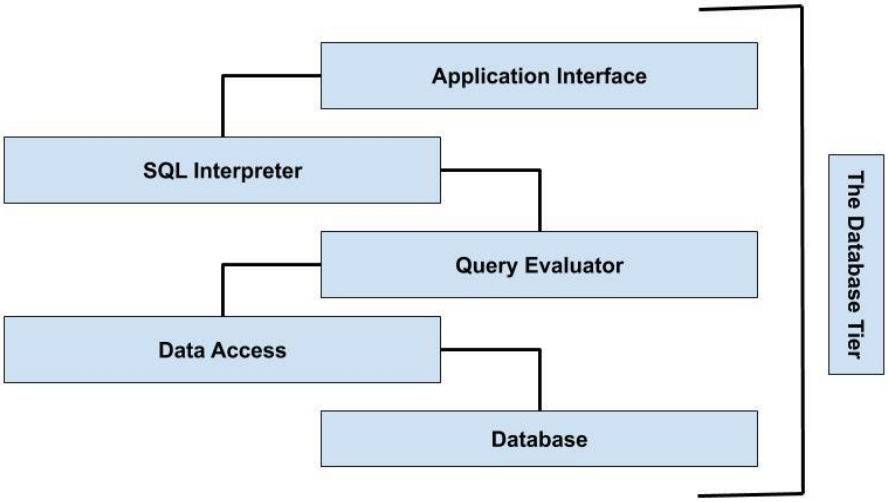
8- It is in BCNF because it has candidate key and primary key and doesn't have trivial dependency.

10- It is in BCNF because it has primary key and candidate key that refers DonorID, PatientID and CenterID, also there is no trivial dependency.

11- It is in BCNF because it has primary key and candidate key.

4. Application Design and Implementation

- **Tiers and Connections**



Application Interface: Libraries for communicating with the DBMS.
SQL Interpreter: A parser that checks the syntax of incoming query statements.
Query Evaluator: Generates different plans for evaluating a query by considering database statistics and properties, selects one of these plans, and translates the plan into low-level actions that are executed.
Data Access: The modules that manage access to the data stored on disk.
Database: The physical data itself stored in data files.

- **Queries in Project**

Query: **Select CenterName**
from BloodCenter

Semantics: List all center names that are we use.

Query:**Insert into**
Donor(DonorID,DonorName,DonorPhone,DonorBloodGroup,
CenterID) Values(@ID,@Name,@Phone,@BloodGroup,@CenterID)

Semantics: Insert datas that donor information with value which are named.

Query: **Select CenterID**
from BloodCenter where CenterName= '" +
DonorCentercomboBox1.SelectedItem.ToString() + "'"

Semantics: List center id's of blood center that have same center name with chosen by user input in listbox.

Query: **Insert into**
Employee (EmployeeID, EmployeeName, EmployeePassword, EmployeePhone, CenterID)
Values(@ID, @Name, @Password, @Phone, @CenterID)

Semantics: Insert datas that employee information with value which are named.

Query: **Select ***
from Donor
where DonorID = '" + deleteıdtextBox1.Text + "' and DonorName = '" + deletenametextBox2.Text + "' and DonorPhone = '" + deletephonetextBox3.Text + "'"

Semantics: List all donors that denote with same id, name and phone with user input.

Query: **Delete**
from Donor
where DonorName = '"
+ listBox1.SelectedItem.ToString() + "'

Semantics: Delete donor which is choosen by user from listbox.

Query: **Select EmployeeName, EmployeePassword**
from Employee
where EmployeeName ='" + UsertextBox.Text + "' and EmployeePassword = '" + PasswordtextBox.Text + "'"

Semantics: List employee name and password that are equal with user input from textbox.

Query: **Select ***
from Donor
where DonorBloodGroup = '" + BloodtextBox.Text + "'
Semantics: List all donor that has same blood type with user input.

Query: **Select ***
from Donor
where DonorName = '" + donorlistBox1.SelectedItem.ToString() + "'

Semantics: Select all donor that has same name with user selected item in listbox.

Query: **Select CenterName**
from BloodCenter where CenterID = '" + dr["CenterID"] + "'

Semantics: List center names that are had same center id with user input.

Query: **Insert into**
Patient (PatientID, PatientName, PatientPhone, PatientBloodGroup)
Values (@ID, @Name, @Phone, @Blood)

Semantics: Insert datas that patient information with value which are named.

Query: **Insert into**
Exchange (PatientID, DonorID,EmployeeID, CenterID)
Values (@Pati, @Donor, @Employee, @Center)

Semantics: Insert datas that exchange information with value which are named.

Query: **Select DonorId**
from Donor
where DonorName= '"
+ donorlistBox1.SelectedItem.ToString() + "'

Semantics: List donor id of donors that are selected from listbox with user input.

Query: **Select EmployeeID,CenterID**
from Employee
where EmployeeName= '" + Form1.user+ "'

Semantics: List employee id and center id that are same value selected itemfrom listbox with employee name.

Query: **Insert into**
OldDonor(DonorID,DonorName,DonorPhone,DonorBloodGroup, CenterID)
Values (@ID,@Name,@Phone,@Blood,@Center)

Semantics: Insert datas that old donor which are denote, information with value which are named.

Query: **Select**
DonorID,DonorName,DonorPhone,DonorBloodGroup,CenterID
from Donor
where DonorName ='" + donorlistBox1.SelectedItem.ToString() + "'

Semantics: List donor id, name, phone, blood type and center id that have same value selected item from listbox with donor name.

Query: **Delete**
from Donor
where DonorName='"
+ donorlistBox1.SelectedItem.ToString() + "'

Semantics: Delete donor which that has same name with choosen by user from listbox.

Query: **Insert into**
Analysis(ExchangeID,WBC,RBC,HGB,MCV,PLT)
Values(@ex,@wbc,@rbc,@hgb,@mcv,@plt)

Semantics: : Insert datas that analysis result which are information with value which are named.

Query: **Select ExchangeID**
from Exchange
where PatientID='" + IDtextBox1.Text+"'

Semantics: List exchange id that has same patient id with user input.

Query: **Select ***
from OldDonor
where DonorID = '" + OldDonorIDtextBox1.Text + "'

Semantics: List all old donors that have same donor id with user input.

Query: **Select DonorID**
from OldDonor
where DonorName='" + OldDonorlistBox1.SelectedItem.ToString() + "'

Semantics: List donor id's that have same donor name with user input from listbox.

Query: **Select Exchange.ExchangeID**
from Exchange
Inner Join OldDonor On
Exchange.DonorID='"+dr["DonorID"].ToString()+"'

Semantics: List exchange id's that have same donor id with exchange and old donor.

Query: **Select Analysis.WBC, Analysis.RBC, Analysis.HGB,**
Analysis.MCV, Analysis.PLT
from Analysis
Inner Join Exchange On Analysis.ExchangeID='" +
dr2["ExchangeID"].ToString() + "'

Semantics: List analysis result that has same exchange id with exchange id and analysis id.

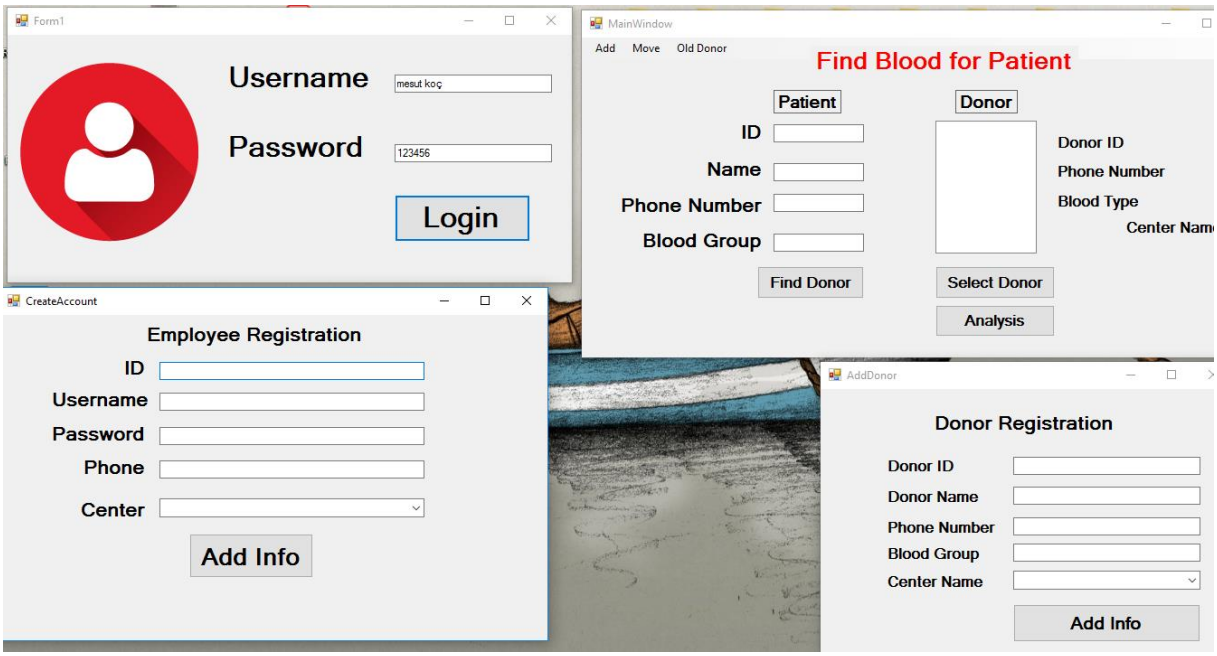
- **Program Language**

  I use C# programing language and develop windows form application. Also, I use Microsoft SQL Server Management Studio to create database.

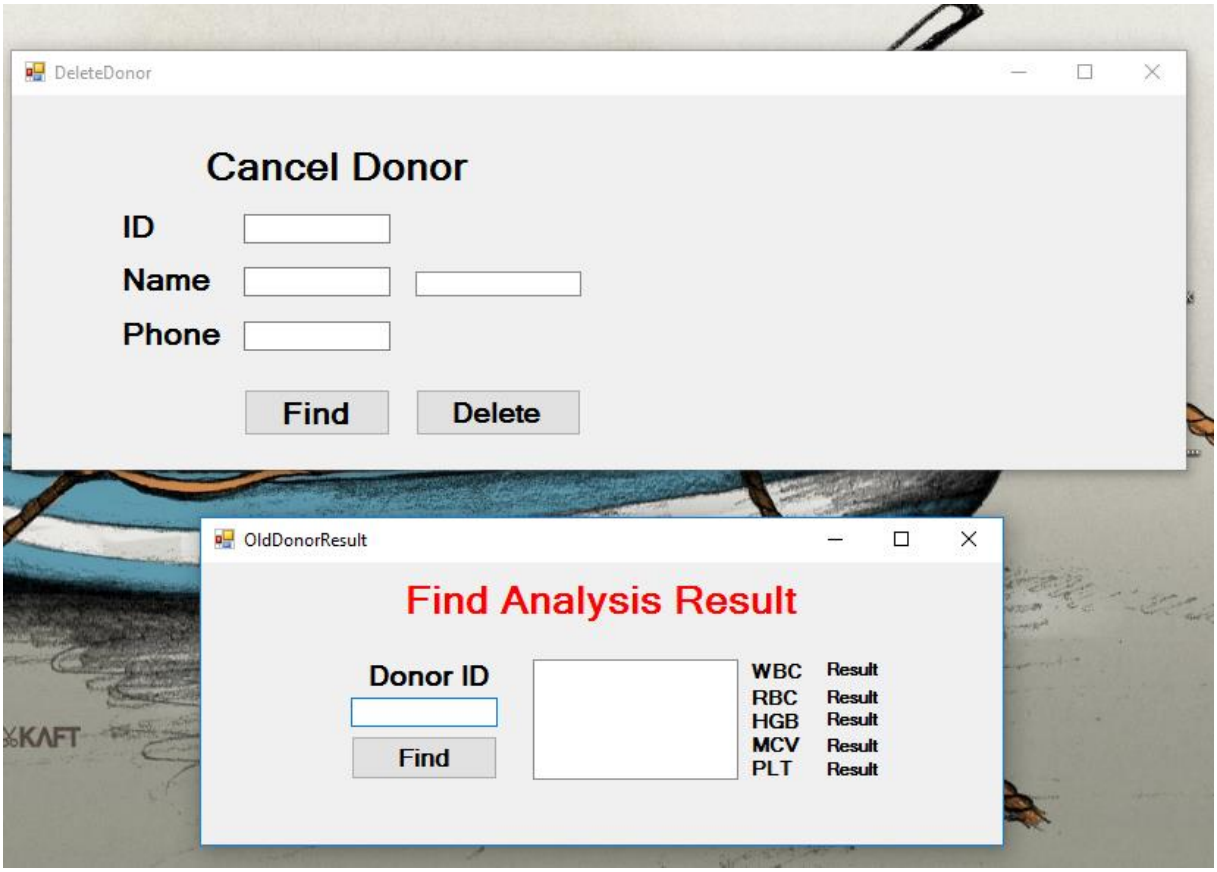
- **Data Source**

  I fetch data from web page (https://www.istanbul.net.tr/kent-rehberi/saglik-kuruluslari/kan-merkezleri/5/170/1) that contains blood center information which are name, phone and address. Secondly, I use exel file that I got it from kaggle.com and I change and add some information on this file.

- **Features of Application**



In this picture, contains forms that employee and donor registration. Also, main window of my application that is find blood for patient.



This picture contains two forms of my application. These are cancel to donor and showing blood analysis result.