Blood Bank Management System Overview

The **Blood Bank Management System** is a comprehensive solution designed to streamline the process of managing blood donations, patient blood requests, donor records, inventory management, and various administrative functions in a blood bank. The system automates and centralizes operations, enabling better coordination, improved efficiency, and easy tracking of all blood-related transactions.

Key Features:

1. **Donor Management:** o Registration of donors with personal and medical details.
   - o Blood donation tracking to ensure the availability of blood for patients.
   - o Donor eligibility checks based on predefined health criteria.
2. **Patient Management:**
   - o Records of patient information, including medical history and blood requirements.
   - o Tracking of patient blood requests and their fulfillment status.
   - o Ability to monitor patient's progress after receiving blood.
3. **Blood Inventory Management:**
   - o Centralized database of blood bags, including types, quantity, and expiry dates.
   - o Automated alerts for blood bags nearing expiration.
   - o Easy management of incoming blood supplies from suppliers.
4. **Blood Request Management:**
   - o Patients or healthcare providers can request specific blood types based on medical requirements.
   - o Monitoring of the status of each blood request, from initiation to fulfillment.
   - o Priority management for critical requests.
5. **Supplier and Supply Chain Management:**
   - o Integration with blood supply providers for managing supply orders.
   - o Tracking of supply orders, deliveries, and inventory update
   - o Deletion of suppliers with no active supply records to maintain system cleanliness.
6. **Feedback and Reporting:**
   - o Collection of feedback from donors and patients about their experiences.

   - o Generation of reports on blood donations, inventory status, patient requests, and feedback.

   - o Administrative tools for analyzing trends and improving blood bank operations.

Table Information:

1. Donor Table

Purpose: Stores personal information about blood donors. **Attributes**:

- **DonorID**: Primary key, uniquely identifies each donor.
- **Name**: Full name of the donor.
- **Age**: Age of the donor.
- **Gender**: Gender of the donor.
- **BloodType**: Blood group of the donor (e.g., A+, B-, O+).
- **Contact**: Unique phone number of the donor.
- **Email**: Unique email address of the donor.
- **Address**: Physical address of the donor.

2. BloodInventory Table

Purpose: Keeps track of available blood units in the inventory. **Attributes**:

- **InventoryID**: Primary key, uniquely identifies each blood inventory record.
- **BloodType**: Type of blood (e.g., A+, O-, etc.).
- **Quantity**: Amount of blood available in stock (in liters, units, etc.).
- **ExpiryDate**: Date when the blood is no longer usable.

3. Donation Table

Purpose: Logs the blood donation events made by donors. **Attributes**:

- **DonationID**: Primary key, uniquely identifies each donation.
- **DonorID**: Foreign key linked to **DonorID** (from Donor table), representing the donor.
- **InventoryID**: Foreign key linked to **InventoryID** (from BloodInventory table), indicating which blood inventory the donation belongs to.
- **DonationDate**: Date the blood donation was made.
- **Quantity**: Amount of blood donated.

4. Patient Table

Purpose: Stores information about patients requiring blood. **Attributes**:

- **PatientID**: Primary key, uniquely identifies each patient.
- **Name**: Full name of the patient.
- **Age**: Age of the patient.
- **Gender**: Gender of the patient.
  Contact: Unique phone number for the patient.

- **Address**: Address of the patient.

5. BloodRequest Table
Purpose: Tracks blood requests made by patients. **Attributes**:

- **RequestID**: Primary key, uniquely identifies each blood request.
- **PatientID**: Foreign key linked to **PatientID** (from Patient table), indicating the patient making the request.
- **BloodType**: Type of blood requested.
- **Quantity**: Amount of blood requested.
- **RequestDate**: Date when the request was made.
- **Status**: Current status of the request (e.g., Pending, Fulfilled, Rejected).

6. Staff Table
Purpose: Stores information about the staff working at the blood bank. **Attributes**:

- **StaffID**: Primary key, uniquely identifies each staff member.
- **Name**: Full name of the staff member.
- **Role**: Job title or role (e.g., Technician, Nurse, Manager).
- **Contact**: Unique phone number of the staff.
- **Email**: Unique email address of the staff.
- **Address**: Physical address of the staff member.

7. Test Table
Purpose: Records medical tests done on donors. **Attributes**:

- **TestID**: Primary key, uniquely identifies each test.
- **DonorID**: Foreign key linked to **DonorID** (from Donor table), indicating the donor being tested.
- **TestDate**: Date the test was performed.
- **TestResult**: Outcome of the test (e.g., positive for a specific disease).
- **StaffID**: Foreign key linked to **StaffID** (from Staff table), indicating the staff member who performed the test.

8. Transactions Table
Purpose: Records transactions involving blood for patients. **Attributes**:

- **TransactionID**: Primary key, uniquely identifies each transaction.
- **PatientID**: Foreign key linked to **PatientID** (from Patient table), indicating the patient receiving the blood.

InventoryID: Foreign key linked to **InventoryID** (from BloodInventory table), indicating which inventory was used.

- **TransactionDate**: Date when the transaction occurred.
- **Quantity**: Amount of blood used in the transaction.

9. Supplier Table

Purpose: Stores information about external suppliers of blood or medical supplies.
Attributes:

- **SupplierID**: Primary key, uniquely identifies each supplier.
- **Name**: Name of the supplier company or individual.
- **Contact**: Unique phone number of the supplier.
- **Address**: Physical address of the supplier.

10. Supply Table

Purpose: Tracks the supplies (blood, medical equipment) provided by suppliers.
Attributes:

- **SupplyID**: Primary key, uniquely identifies each supply record.
- **SupplierID**: Foreign key linked to **SupplierID** (from Supplier table), indicating which supplier provided the supply.
- **InventoryID**: Foreign key linked to **InventoryID** (from BloodInventory table), indicating which inventory was supplied.
- **SupplyDate**: Date when the supply was received.
- **Quantity**: Amount of inventory supplied.

11. Appointment Table

Purpose: Records appointments made by donors for blood donation. **Attributes**:

- **AppointmentID**: Primary key, uniquely identifies each appointment.
- **DonorID**: Foreign key linked to **DonorID** (from Donor table), indicating the donor who scheduled the appointment.
- **StaffID**: Foreign key linked to **StaffID** (from Staff table), indicating the staff member assigned to the appointment.
- **AppointmentDate**: Date and time of the appointment.

12. Campaign Table

Purpose: Stores information about blood donation campaigns. **Attributes**:

- **CampaignID**: Primary key, uniquely identifies each campaign.
- **Name**: Name of the campaign (e.g., "Blood Drive 2025").

- **StartDate**: Start date of the campaign.
- **EndDate**: End date of the campaign.
- **Location**: Location where the campaign is taking place.
    StaffID: Foreign key linked to **StaffID** (from Staff table), indicating the staff member overseeing the campaign.

13. Feedback Table

Purpose: Collects feedback from donors and patients about their experiences. **Attributes**:

- **FeedbackID**: Primary key, uniquely identifies each feedback record.
- **DonorID**: Foreign key linked to **DonorID** (from Donor table), indicating which donor provided the feedback.
- **PatientID**: Foreign key linked to **PatientID** (from Patient table), indicating which patient provided the feedback.
- **FeedbackDate**: Date when the feedback was given.
- **Comments**: Comments or feedback provided by the donor/patient.

14. Payment Table

Purpose: Records payments made for blood or medical supplies transactions. **Attributes**:

- **PaymentID**: Primary key, uniquely identifies each payment.
- **TransactionID**: Foreign key linked to **TransactionID** (from Transactions table), indicating which transaction the payment is associated with.
- **Amount**: Amount paid for the transaction.
- **PaymentDate**: Date the payment was made.
- **PaymentMethod**: Method of payment (e.g., Credit Card, Cash).

15. EmergencyContact Table

Purpose: Stores emergency contact information for donors. **Attributes**:

- **ContactID**: Primary key, uniquely identifies each emergency contact record.
- **DonorID**: Foreign key linked to **DonorID** (from Donor table), indicating the donor who has the emergency contact.
- **Name**: Name of the emergency contact.
- **Relation**: Relationship of the emergency contact to the donor (e.g., spouse, parent).
- **Phone**: Unique phone number of the emergency contact.

16. UserAccount Table

Purpose: Stores user account information for system login. **Attributes**:

- **UserID**: Primary key, uniquely identifies each user account.
- **Username**: Unique username for logging into the system.
- **Password**: Encrypted password for the account.
   Role: User's role (e.g., Admin, Staff, Donor, Patient).

Relationships and Usage:

- **Donor and BloodInventory**: Donors provide blood that is stored in the blood inventory.
- **Donor and Donation**: The **Donation** table logs the blood donations made by each **Donor**.
- **Patient and BloodRequest**: Patients request blood based on their needs, tracked in the **BloodRequest** table.
- **BloodInventory and Transactions**: Blood from the **BloodInventory** table is used for patient treatments, tracked in **Transactions**.
- **Staff and Test**: Staff members perform tests on donors, recorded in the **Test** table.
- **Staff and Campaign**: Staff members organize blood donation campaigns, tracked in **Campaign**.
- **Payment and Transactions**: Payments are linked to Transactions, representing monetary exchange for blood or medical supplies.

Button Actions and SQL Queries

S.No	Button Name	Description	SQL Query
1	Donor Data	Displays the details of all registered donors.	SELECT DonorID, Name, Age, Gender, BloodType, Contact, Email, Address FROM Donor
2	Donation Summary	Shows the summary of donations made by each donor.	SELECT d.Name AS DonorName, SUM(dn.Quantity) AS TotalDonated FROM Donor d INNER JOIN Donation dn ON d.DonorID = dn.DonorID GROUP BY d.Name
3	Emergency Contacts	Displays the emergency contacts associated with donors.	SELECT d.DonorID, ec.ContactID, d.Name AS DonorName, ec.Name AS EmergencyContactName, ec.Relation, ec.Phone FROM Donor d JOIN EmergencyContact ec ON d.DonorID = ec.DonorID
4	Blood Requests	Shows all the blood	SELECT RequestID,

		requests made by patients.	PatientID, BloodType, Quantity, RequestDate, Status FROM BloodRequest
5	View Patient Records	Shows records of all patients.	SELECT PatientID, Name, Age, Gender, Contact, Address FROM Patient
6	View Staff Records	Displays the details of all staff members.	SELECT StaffID, Name, Role, Contact, Email, Address FROM Staff
7	Inventory	Shows the current blood inventory.	SELECT InventoryID, BloodType, Quantity, ExpiryDate FROM BloodInventory
8	Pending Requests	Displays blood requests that are still pending.	SELECT br.RequestID, br.BloodType, br.Quantity, br.RequestDate, p.Name AS PatientName, p.Contact FROM BloodRequest br INNER JOIN Patient p ON br.PatientID = p.PatientID WHERE br.Status = 'Pending'
9	Donation Details	Shows details of all donations made.	SELECT dn.DonationID, dn.DonorID, d.Name AS DonorName, SUM(dn.Quantity) AS TotalDonated FROM Donation dn INNER JOIN Donor d ON dn.DonorID = d.DonorID GROUP BY dn.DonationID, dn.DonorID, d.Name
10	Expired Inventory	Displays inventory items that have expired.	SELECT * FROM BloodInventory WHERE ExpiryDate < CURDATE()
11	Campaign Details	Shows details of blood donation campaigns.	SELECT c.CampaignID, c.Name AS CampaignName, c.StartDate, c.EndDate, c.Location, s.Name AS StaffName, s.Role FROM Campaign c INNER JOIN Staff s ON

			c.StaffID = s.StaffID
12	Transaction Details	Displays the transaction details related to donations.	SELECT t.TransactionID, p.Name AS PatientName, p.Contact, bi.BloodType, t.Quantity, t.TransactionDate FROM Transactions t INNER JOIN Patient p ON t.PatientID = p.PatientID INNER JOIN BloodInventory bi ON t.InventoryID = bi.InventoryID
13	Appointments	Shows appointment details for donors.	SELECT a.AppointmentID, d.Name AS DonorName, s.Name AS StaffName, a.AppointmentDate FROM Appointment a INNER JOIN Donor d ON a.DonorID = d.DonorID INNER JOIN Staff s ON a.StaffID = s.StaffID ORDER BY a.AppointmentDate DESC
14	View Supplier-Supply Details	Displays details of all suppliers and their supplies.	SELECT s.SupplierID, s.Name AS SupplierName, s.Contact, s.Address, sp.SupplyID, sp.InventoryID, sp.SupplyDate, sp.Quantity FROM Supplier s INNER JOIN Supply sp ON s.SupplierID = sp.SupplierID
15	View Supplier-Without Supply	Shows suppliers who haven't provided any supply.	SELECT s.SupplierID, s.Name AS SupplierName, s.Contact, s.Address FROM Supplier s LEFT JOIN Supply sp ON s.SupplierID = sp.SupplierID WHERE sp.SupplyID IS NULL
16	Feedback Details	Displays all	SELECT f.FeedbackID,

			feedback from donors and patients.	d.Name AS DonorName, p.Name AS PatientName, f.FeedbackDate, f.Comments FROM Feedback f LEFT JOIN Donor d ON f.DonorID = d.DonorID LEFT JOIN Patient p ON f.PatientID = p.PatientID
17	Insert Donor	Adds a new donor to the system.	INSERT INTO Donor (DonorID, Name, Age, Gender, Contact, Address) VALUES (?, ?, ?, ?, ?, ?)
18	Insert Blood Inventory	Adds new blood inventory details.	INSERT INTO BloodInventory (InventoryID, BloodType, Quantity, ExpiryDate) VALUES (?, ?, ?, ?)
19	Insert Patient	Adds a new patient to the system.	INSERT INTO Patient (PatientID, Name, Age, Gender, Contact, Address) VALUES (?, ?, ?, ?, ?, ?)
20	Insert Blood Request	Inserts a new blood request from a patient.	INSERT INTO BloodRequest (RequestID, PatientID, BloodType, Quantity, Status) VALUES (?, ?, ?, ?, ?)
21	Insert Emergency Contact	Inserts a new emergency contact for a donor.	INSERT INTO EmergencyContact (ContactID, DonorID, Name, Phone, Relationship) VALUES (?, ?, ?, ?, ?)
22	Insert Feedback	Inserts feedback for a donor or patient.	INSERT INTO Feedback (FeedbackID, DonorID, PatientID, FeedbackDate, Comments) VALUES (?, ?, ?, ?, ?)
23	Insert Campaign	Adds a new blood donation campaign.	INSERT INTO Campaign (CampaignID, Name, Location, StartDate, EndDate) VALUES (?, ?, ?, ?, ?)
24	Insert Staff	Adds a new staff member to the	INSERT INTO Staff (StaffID, Name, Role,

		system.	Contact, Email, Address) VALUES (?, ?, ?, ?, ?, ?)
25	Insert Transaction	Adds a new transaction record for a donation.	INSERT INTO Transactions (TransactionID, DonorID, Amount, Date) VALUES (?, ?, ?, ?)
26	Merge Emergency Contact	Merges duplicate emergency contact entries.	UPDATE EmergencyContact SET DonorID = ? WHERE ContactID = ?
27	Update Blood Request	Updates the details of an existing blood request.	UPDATE BloodRequest SET Status = ?, Quantity = ? WHERE RequestID = ?
28	Update Feedback	Updates feedback details for a donor or patient.	UPDATE Feedback SET Comments = ? WHERE FeedbackID = ?
29	Update Campaign	Updates the details of an existing campaign.	UPDATE Campaign SET Name = ?, Location = ?, StartDate = ?, EndDate = ? WHERE CampaignID = ?
30	Update Blood Inventory	Updates the details of blood inventory.	UPDATE BloodInventory SET Quantity = ?, ExpiryDate = ? WHERE InventoryID = ?
31	Update Staff Role	Updates the role of a staff member.	UPDATE Staff SET Role = ? WHERE StaffID = ?
32	Insert Payment	Adds a new payment record.	INSERT INTO Payment (PaymentID, DonorID, Amount, Date) VALUES (?, ?, ?, ?)
33	Insert Donation	Registers a new donation record.	INSERT INTO Donation (DonationID, DonorID, Date, Quantity) VALUES (?, ?, ?, ?)
34	Add Supplier	Adds a new supplier to the system.	INSERT INTO Supplier (SupplierID, Name, Contact, Address) VALUES (?, ?, ?, ?)
35	Add Supply	Adds a new supply record from a supplier.	INSERT INTO Supply (SupplyID, SupplierID, InventoryID, SupplyDate, Quantity) VALUES (?, ?, ?, ?, ?)
36	Delete Blood Request	Deletes a blood request from the system.	DELETE FROM BloodRequest WHERE RequestID = ?

37	Delete Donors (Age > 60)	Deletes donors aged over 60.	DELETE FROM Donor WHERE Age > 60
38	Delete Unlinked Patients	Deletes patients not linked to any requests, feedback, or transactions.	DELETE FROM Patient WHERE PatientID NOT IN (SELECT DISTINCT PatientID FROM BloodRequest) AND PatientID NOT IN (SELECT DISTINCT PatientID FROM Feedback) AND PatientID NOT IN (SELECT DISTINCT PatientID FROM Transactions)
39	Delete Unlinked Donors	Deletes donors not linked to donation, test, appointment, feedback, or emergency contact records.	DELETE FROM Donor WHERE DonorID NOT IN (SELECT DISTINCT DonorID FROM Donation) AND DonorID NOT IN (SELECT DISTINCT DonorID FROM Test) AND DonorID NOT IN (SELECT DISTINCT DonorID FROM Appointment) AND DonorID NOT IN (SELECT DISTINCT DonorID FROM Feedback) AND DonorID NOT IN (SELECT DISTINCT DonorID FROM EmergencyContact)
40	Delete Supplier Without Supply	Deletes suppliers who have not supplied any blood.	DELETE FROM Supplier WHERE SupplierID NOT IN (SELECT DISTINCT SupplierID FROM Supply)

Design Documentation

1. Schema Design Decisions:

- The schema is normalized to eliminate redundancy and ensure data integrity.
- Primary keys are used in all tables for unique identification.
- Foreign keys ensure relationships between tables (e.g., DonorID, StaffID, PatientID).

- Use of lookup tables like BloodInventory simplifies data access and updates.
- Date and quantity fields are included to handle operations like expiration checks and stock levels.

2. Entity-Attribute Relationships:
- Donor ↔ Donation ↔ BloodInventory: Donors donate blood, which is stored in inventory.
- Patient ↔ BloodRequest ↔ Transactions: Patients make blood requests and are linked to blood transactions.
- Staff ↔ Test / Campaign / Appointment: Staff members manage tests, campaigns, and appointments.
- Supplier ↔ Supply ↔ Inventory: Suppliers provide blood supplies linked to inventory.
- Feedback connects Donor and Patient via reviews/comments.
- EmergencyContact relates to Donor for emergency communication.

3. Assumptions Made:
- Each donor/patient can have only one emergency contact.
- Quantity unit is assumed consistent across records.
- Donor eligibility is verified externally before donation.
- Expired blood is unusable as per expiry date.
- Staff roles are stored as string fields (e.g., Technician).
Each transaction involves one donation unit transferred to a patient.