Coding Challenge - Loan Management System

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Problem Statement:

Create SQL Schema from the customer and loan class, use the class attributes for table column names.

1. Define a `Customer` class with the following confidential attributes:

a. Customer ID

b. Name

c. Email Address

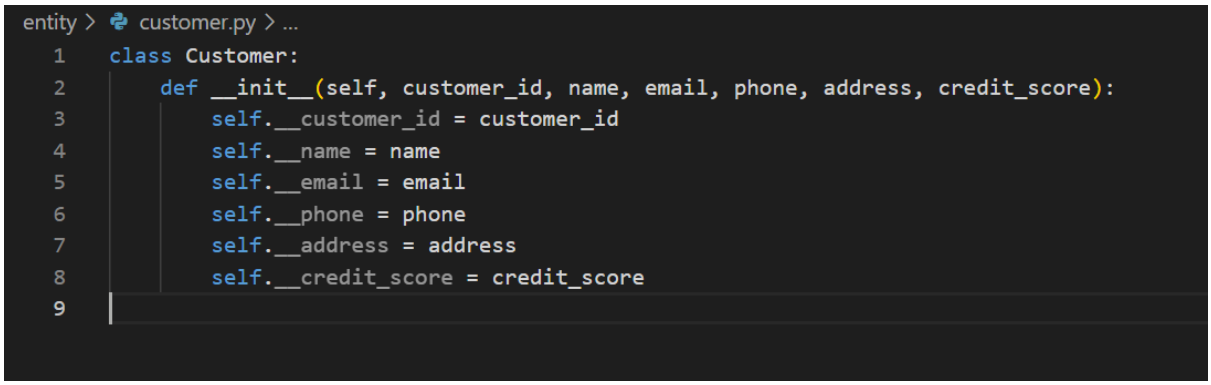
d. Phone Number

e. Address

f. creditScore

Code:

```
class Customer:
    def __init__(self, customer_id, name, email, phone, address, credit_score):
        self.__customer_id = customer_id
        self.__name = name
        self.__email = email
        self.__phone = phone
        self.__address = address
        self.__credit_score = credit_score
```



Sql Schema:

```
CREATE TABLE customer (
   customer_id INT PRIMARY KEY AUTO_INCREMENT,
   name VARCHAR(100),
   email VARCHAR(100) UNIQUE,
   phone VARCHAR(15),
   address VARCHAR(255),
   credit_score INT);
```

```
mysql> use loan;
Database changed
mysql> CREATE TABLE customer (
    ->     customer_id INT PRIMARY KEY AUTO_INCREMENT,
    ->     name VARCHAR(100),
    ->     email VARCHAR(100) UNIQUE,
    ->     phone VARCHAR(15),
    ->     address VARCHAR(255),
    ->     credit_score INT
    -> );
Query OK, 0 rows affected (0.13 sec)
```

2. Define a base class `Loan` with the following attributes:

a. loanId

b. customer (reference of customer class)

c. principalAmount

d. interestRate

e. loanTerm (Loan Tenure in months)

f. loanType (CarLoan, HomeLoan)

g. loanStatus (Pending, Approved)

Code:

```
from .customer import Customer

class Loan:
   def __init__(self, loan_id, customer: Customer, principal_amount, interest_rate, loan_term, loan_type, loan_status):
```

self.__loan_id = loan_id

self.__customer = customer

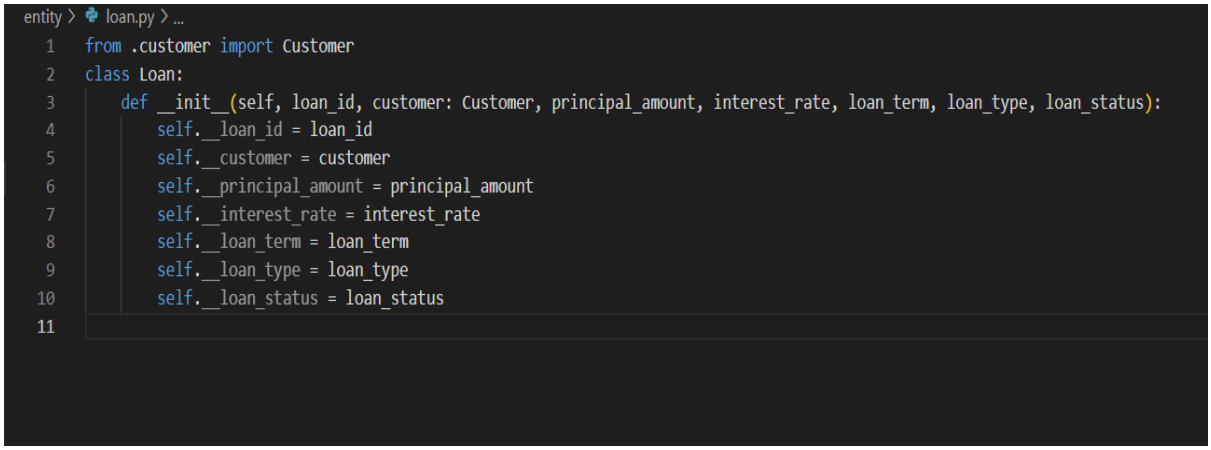
self.__principal_amount = principal_amount

self.__interest_rate = interest_rate

self.__loan_term = loan_term

self.__loan_type = loan_type

self.__loan_status = loan_status



Sql Schema:

CREATE TABLE loan (

loan_id INT PRIMARY KEY AUTO_INCREMENT,

customer_id INT,

principal_amount DECIMAL(12,2),

interest_rate DECIMAL(5,2),

loan_term INT,

loan_type ENUM('CarLoan', 'HomeLoan'),

loan_status ENUM('Pending', 'Approved'),

FOREIGN KEY (customer_id) REFERENCES customer(customer_id)

);

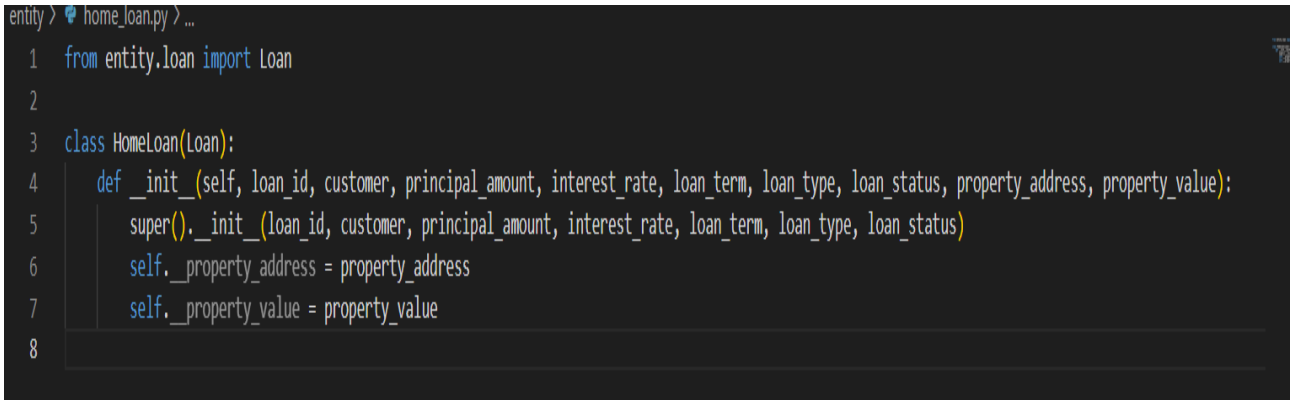
```
mysql> CREATE TABLE loan (
    ->     loan_id INT PRIMARY KEY AUTO_INCREMENT,
    ->     customer_id INT,
    ->     principal_amount DECIMAL(12,2),
    ->     interest_rate DECIMAL(5,2),
    ->     loan_term INT,
    ->     loan_type ENUM('CarLoan', 'HomeLoan'),
    ->     loan_status ENUM('Pending', 'Approved'),
    ->     FOREIGN KEY (customer_id) REFERENCES customer(customer_id)
    -> );
Query OK, 0 rows affected (0.10 sec)
```

3. Create two subclasses: `HomeLoan` and `CarLoan`. These subclasses should inherit from the Loan class and add attributes specific to their loan types. For example:

a. HomeLoan should have a propertyAddress (String) and propertyValue (int) attribute.

Code:

```
from entity.loan import Loan

class HomeLoan(Loan):

    def __init__(self, loan_id, customer, principal_amount, interest_rate, loan_term, loan_type, loan_status, property_address, property_value):

        super().__init__(loan_id, customer, principal_amount, interest_rate, loan_term, loan_type, loan_status)

        self.__property_address = property_address

        self.__property_value = property_value
```



b. CarLoan should have a carModel (String) and carValue (int) attribute.

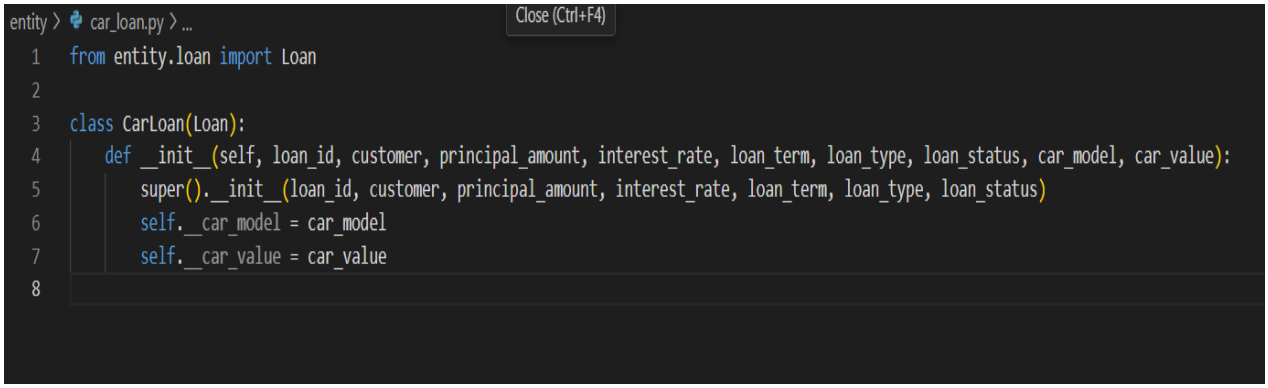
Code:

```
from entity.loan import Loan


class CarLoan(Loan):

    def __init__(self, loan_id, customer, principal_amount, interest_rate, loan_term, loan_type, loan_status, car_model, car_value):
```

super().__init__(loan_id, customer, principal_amount, interest_rate, loan_term, loan_type, loan_status)

self.__car_model = car_model

self.__car_value = car_value



4. Implement the following for all classes.

a. Write default constructors and overload the constructor with parameters, generate getter and setter, (print all information of attribute) methods for the attributes.

Customer code:

Getter setter

def get_customer_id(self): return self.__customer_id

def set_customer_id(self, customer_id): self.__customer_id = customer_id

def get_name(self): return self.__name

def set_name(self, name): self.__name = name

def get_email(self): return self.__email

def set_email(self, email): self.__email = email

def get_phone(self): return self.__phone

def set_phone(self, phone): self.__phone = phone

def get_address(self): return self.__address

def set_address(self, address): self.__address = address

def get_credit_score(self): return self.__credit_score

def set_credit_score(self, credit_score): self.__credit_score = credit_score

Print

def display_info(self):

print(f"Customer ID: {self.__customer_id}")

print(f"Name: {self.__name}")

print(f"Email: {self.__email}")

print(f"Phone: {self.__phone}")

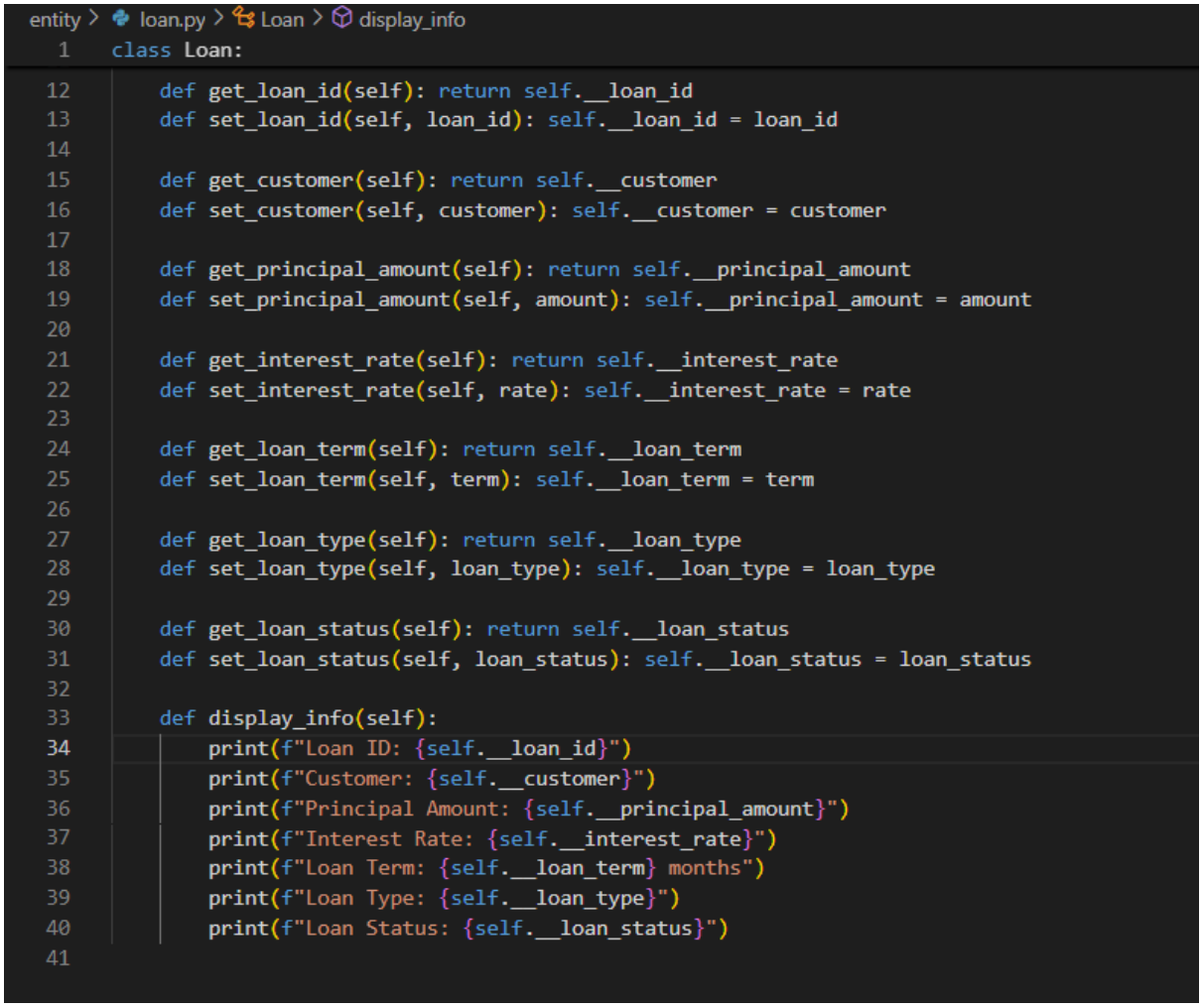
print(f"Address: {self.__address}")

print(f"Credit Score: {self.__credit_score}")

```python
class Customer:
    # Getter setter
    def get_customer_id(self): return self.__customer_id
    def set_customer_id(self, customer_id): self.__customer_id = customer_id

    def get_name(self): return self.__name
    def set_name(self, name): self.__name = name

    def get_email(self): return self.__email
    def set_email(self, email): self.__email = email

    def get_phone(self): return self.__phone
    def set_phone(self, phone): self.__phone = phone

    def get_address(self): return self.__address
    def set_address(self, address): self.__address = address

    def get_credit_score(self): return self.__credit_score
    def set_credit_score(self, credit_score): self.__credit_score = credit_score

    # Print
    def display_info(self):
        print(f"Customer ID: {self.__customer_id}")
        print(f"Name: {self.__name}")
        print(f"Email: {self.__email}")
        print(f"Phone: {self.__phone}")
        print(f"Address: {self.__address}")
        print(f"Credit Score: {self.__credit_score}")
```

Loan Code:

```
def get_loan_id(self): return self.__loan_id
    def set_loan_id(self, loan_id): self.__loan_id = loan_id

    def get_customer(self): return self.__customer
    def set_customer(self, customer): self.__customer = customer

    def get_principal_amount(self): return self.__principal_amount
    def set_principal_amount(self, amount): self.__principal_amount = amount

    def get_interest_rate(self): return self.__interest_rate
    def set_interest_rate(self, rate): self.__interest_rate = rate

    def get_loan_term(self): return self.__loan_term
    def set_loan_term(self, term): self.__loan_term = term

    def get_loan_type(self): return self.__loan_type
    def set_loan_type(self, loan_type): self.__loan_type = loan_type

    def get_loan_status(self): return self.__loan_status
    def set_loan_status(self, loan_status): self.__loan_status = loan_status

    def display_info(self):
        print(f"Loan ID: {self.__loan_id}")
        print(f"Customer: {self.__customer}")
        print(f"Principal Amount: {self.__principal_amount}")
        print(f"Interest Rate: {self.__interest_rate}")
        print(f"Loan Term: {self.__loan_term} months")
        print(f"Loan Type: {self.__loan_type}")
        print(f"Loan Status: {self.__loan_status}")
```



Home_loan:

```
def get_property_address(self): return self.__property_address
    def set_property_address(self, address): self.__property_address = address


    def get_property_value(self): return self.__property_value
    def set_property_value(self, value): self.__property_value = value


    def display_info(self):
        super().display_info()
        print(f"Property Address: {self.__property_address}")
        print(f"Property Value: {self.__property_value}")
```

entity > home_loan.py > ...

```
3   class HomeLoan(Loan):
10      def get_property_address(self): return self.__property_address
11      def set_property_address(self, address): self.__property_address = address
12
13      def get_property_value(self): return self.__property_value
14      def set_property_value(self, value): self.__property_value = value
15
16      def display_info(self):
17          super().display_info()
18          print(f"Property Address: {self.__property_address}")
19          print(f"Property Value: {self.__property_value}")
20
```

Car loan:

def get_car_model(self): return self.__car_model

def set_car_model(self, model): self.__car_model = model

def get_car_value(self): return self.__car_value

def set_car_value(self, value): self.__car_value = value

def display_info(self):

super().display_info()

print(f"Car Model: {self.__car_model}")

print(f"Car Value: {self.__car_value}")

entity > car_loan.py > ...

```
3   class CarLoan(Loan):
10      def get_car_model(self): return self.__car_model
11      def set_car_model(self, model): self.__car_model = model
12
13      def get_car_value(self): return self.__car_value
14      def set_car_value(self, value): self.__car_value = value
15
16      def display_info(self):
17          super().display_info()
18          print(f"Car Model: {self.__car_model}")
19          print(f"Car Value: {self.__car_value}")
20
```

5. Define ILoanRepository interface/abstract class with following methods to interact with database.

Code:

```
from abc import ABC, abstractmethod
class ILoanRepository(ABC):
    @abstractmethod
    def apply_loan(self, loan):
        pass
    @abstractmethod
    def calculate_interest(self, loan_id):
        pass
    @abstractmethod
    def calculate_interest_manual(self, principal, rate, term):
        pass
    @abstractmethod
    def loan_status(self, loan_id):
        pas
    @abstractmethod
    def calculate_emi(self, loan_id):
        pas
    @abstractmethod
    def calculate_emi_manual(self, principal, rate, term):
        pass
    @abstractmethod
    def loan_repayment(self, loan_id, amount):
        pass
    @abstractmethod
    def get_all_loans(self):
        pass
    @abstractmethod
    def get_loan_by_id(self, loan_id):
        pass
```

dao > interface > i_loan_repository.py > ...

```python
from abc import ABC, abstractmethod

class ILoanRepository(ABC):

    @abstractmethod
    def apply_loan(self, loan):
        pass

    @abstractmethod
    def calculate_interest(self, loan_id):
        pass

    @abstractmethod
    def calculate_interest_manual(self, principal, rate, term):
        pass

    @abstractmethod
    def loan_status(self, loan_id):
        pass

    @abstractmethod
    def calculate_emi(self, loan_id):
        pass

    @abstractmethod
    def calculate_emi_manual(self, principal, rate, term):
        pass

    @abstractmethod
    def loan_repayment(self, loan_id, amount):
        pass

    @abstractmethod
    def get_all_loans(self):
        pass

    @abstractmethod
    def get_loan_by_id(self, loan_id):
        pass

```

a.**applyLoan(loan Loan):** pass appropriate parameters for creating loan. Initially loan status is pending and stored in database. before storing in database get confirmation from the user as Yes/No

Code:

```
import mysql.connector
from dao.interface.i_loan_repository import ILoanRepository
from exception.invalid_loan_exception import InvalidLoanException
from util.db_conn_util import DBConnUtil
from entity.loan import Loan

class LoanRepositoryImpl(ILoanRepository):

    def apply_loan(self, loan):
        try:
            confirm = input("Do you want to apply for the loan? (Yes/No): ").strip().lower()
            if confirm != 'yes':
                print("Loan application cancelled.")
                return

            conn = DBConnUtil.get_connection()
            cursor = conn.cursor()
            query = """
                INSERT INTO loan (customer_id, principal_amount, interest_rate, loan_term, loan_type, loan_status)
                VALUES (%s, %s, %s, %s, %s, %s)
            """
            values = (
                loan.get_customer().get_customer_id(),
                loan.get_principal_amount(),
                loan.get_interest_rate(),
                loan.get_loan_term(),
                loan.get_loan_type(),
```

```
        'Pending'
    )
    cursor.execute(query, values)
    conn.commit()
    print(" Loan application submitted successfully.")
except Exception as e:
    print(" Error applying loan:", e)
finally:
    cursor.close()
    conn.close()
```

dao > interface > loan_repository_impl.py > LoanRepositoryImpl > calculate_interest

```python
import mysql.connector
from dao.interface.i_loan_repository import ILoanRepository
from exception.invalid_loan_exception import InvalidLoanException
from util.db_conn_util import DBConnUtil
from entity.loan import Loan

class LoanRepositoryImpl(ILoanRepository):

    def apply_loan(self, loan):
        try:
            confirm = input("Do you want to apply for the loan? (Yes/No): ").strip().lower()
            if confirm != 'yes':
                print("Loan application cancelled.")
                return

            conn = DBConnUtil.get_connection()
            cursor = conn.cursor()
            query = """
                INSERT INTO loan (customer_id, principal_amount, interest_rate, loan_term, loan_type, loan_status)
                VALUES (%s, %s, %s, %s, %s, %s)
            """
            values = (
                loan.get_customer().get_customer_id(),
                loan.get_principal_amount(),
                loan.get_interest_rate(),
                loan.get_loan_term(),
                loan.get_loan_type(),
                'Pending'
            )
            cursor.execute(query, values)
            conn.commit()
            print("✅ Loan application submitted successfully.")
        except Exception as e:
            print("❌ Error applying loan:", e)
        finally:
            cursor.close()
            conn.close()
```

b. calculateInterest(loanId): This method should calculate and return the interest amount for the loan. Loan should be retrieved from database and calculate the interest amount if loan not found generate InvalidLoanException.

i. Overload the same method with required parameters to calculate the loan interest amount. It is used to calculate the loan interest while creating loan.

ii. Interest = (Principal Amount * Interest Rate * Loan Tenure) / 12

Code:

```
    def calculate_interest(self, loan_id):
        try:
            conn = DBConnUtil.get_connection()
            cursor = conn.cursor()
            cursor.execute("SELECT principal_amount, interest_rate, loan_term FROM loan WHERE
loan_id = %s", (loan_id,))
            row = cursor.fetchone()
            if row:
                principal, rate, term = row
                interest = (principal * rate * term) / 1200
                print(f"Interest for Loan ID {loan_id}: ₹{interest:.2f}")
                return interest
            else:
                raise InvalidLoanException("Loan not found for ID: " + str(loan_id))
        except InvalidLoanException as e:
            print("X", e)
        finally:
            cursor.close()
            conn.close()

        def calculate_interest_manual(self, principal, rate, term):
            interest = (principal * rate * term) / 1200
            print(f"Manual Interest: ₹{interest:.2f}")
            return interest
```

```python
def calculate_interest(self, loan_id):
    try:
        conn = DBConnUtil.get_connection()
        cursor = conn.cursor()
        cursor.execute("SELECT principal_amount, interest_rate, loan_term FROM loan WHERE loan_id = %s", (loan_id,))
        row = cursor.fetchone()
        if row:
            principal, rate, term = row
            interest = (principal * rate * term) / 1200
            print(f"✅ Interest for Loan ID {loan_id}: ₹{interest:.2f}")
            return interest
        else:
            raise InvalidLoanException("Loan not found for ID: " + str(loan_id))
    except InvalidLoanException as e:
        print("❌", e)
    finally:
        cursor.close()
        conn.close()

    def calculate_interest_manual(self, principal, rate, term):
        interest = (principal * rate * term) / 1200
        print(f"✅ Manual Interest: ₹{interest:.2f}")
        return interest
```

c. loanStatus(loanId): This method should display a message indicating that the loan is approved or rejected based on credit score, if credit score above 650 loan approved else rejected and should update in database.

Code:

```
def loan_status(self, loan_id):
    try:
        conn = DBConnUtil.get_connection()
        cursor = conn.cursor()
        cursor.execute("""
            SELECT c.credit_score FROM loan l
            JOIN customer c ON l.customer_id = c.customer_id
            WHERE l.loan_id = %s
        """, (loan_id,))
        row = cursor.fetchone()
        if row:
            credit_score = row[0]
            status = "Approved" if credit_score > 650 else "Rejected"
```

cursor.execute("UPDATE loan SET loan_status = %s WHERE loan_id = %s", (status, loan_id))

conn.commit()

print(f" Loan Status for Loan ID {loan_id}: {status}")

else:

raise InvalidLoanException("Loan not found for ID: " + str(loan_id))

except InvalidLoanException as e:

print("X", e)

finally:

cursor.close()

conn.close()

```
def loan_status(self, loan_id):
    try:
        conn = DBConnUtil.get_connection()
        cursor = conn.cursor()
        cursor.execute("""
            SELECT c.credit_score FROM loan l
            JOIN customer c ON l.customer_id = c.customer_id
            WHERE l.loan_id = %s
        """, (loan_id,))
        row = cursor.fetchone()
        if row:
            credit_score = row[0]
            status = "Approved" if credit_score > 650 else "Rejected"
            cursor.execute("UPDATE loan SET loan_status = %s WHERE loan_id = %s", (status, loan_id))
            conn.commit()
            print(f"✅ Loan Status for Loan ID {loan_id}: {status}")
        else:
            raise InvalidLoanException("Loan not found for ID: " + str(loan_id))
    except InvalidLoanException as e:
        print("❌", e)
    finally:
        cursor.close()
        conn.close()
```

d. calculateEMI(loanId): This method will calculate the emi amount for a month to repayment. Loan should be retrieved from database and calculate the interest amount, if loan not found generate InvalidLoanException.

i. Overload the same method with required parameters to calculate the loan EMI amount. It is used to calculate the loan EMI while creating loan.

ii.EMI = [P * R * (1+R)^N] / [(1+R)^N-1]

1. EMI: The Equated Monthly Installment.

2. P: Principal Amount (Loan Amount).

3. R: Monthly Interest Rate (Annual Interest Rate / 12 / 100).

4. N: Loan Tenure in months.

Code:

```
  def calculate_emi(self, loan_id):
          try:
             conn = DBConnUtil.get_connection()
             cursor = conn.cursor()
             cursor.execute("SELECT principal_amount, interest_rate, loan_term FROM loan WHERE
loan_id = %s", (loan_id,))
             row = cursor.fetchone()
             if row:
                P, R_annual, N = row
                R = R_annual / (12 * 100)  # monthly rate
                emi = (P * R * (1 + R) ** N) / ((1 + R) ** N - 1)
                print(f" EMI for Loan ID {loan_id}: ₹{emi:.2f}")
                return emi
             else:
                raise InvalidLoanException("Loan not found for ID: " + str(loan_id))
          except InvalidLoanException as e:
             print("X", e)
          finally:
             cursor.close()
             conn.close()


       def calculate_emi_manual(self, principal, rate, term):
          R = rate / (12 * 100)
          emi = (principal * R * (1 + R) ** term) / ((1 + R) ** term - 1)
          print(f" Manual EMI: ₹{emi:.2f}")
          return emi
```

```python
def calculate_emi(self, loan_id):
    try:
        conn = DBConnUtil.get_connection()
        cursor = conn.cursor()
        cursor.execute("SELECT principal_amount, interest_rate, loan_term FROM loan WHERE loan_id = %s", (loan_id,))
        row = cursor.fetchone()
        if row:
            P, R_annual, N = row
            R = R_annual / (12 * 100)  # monthly rate
            emi = (P * R * (1 + R) ** N) / ((1 + R) ** N - 1)
            print(f"✅ EMI for Loan ID {loan_id}: ₹{emi:.2f}")
            return emi
        else:
            raise InvalidLoanException("Loan not found for ID: " + str(loan_id))
    except InvalidLoanException as e:
        print("❌", e)
    finally:
        cursor.close()
        conn.close()

def calculate_emi_manual(self, principal, rate, term):
    R = rate / (12 * 100)
    emi = (principal * R * (1 + R) ** term) / ((1 + R) ** term - 1)
    print(f"✅ Manual EMI: ₹{emi:.2f}")
    return emi
```

e. loanRepayment(loanId, amount): calculate the noOfEmi can be paid from the amount if the amount is less than single emi reject the payment or pay the emi in whole number and update the variable.

Code:

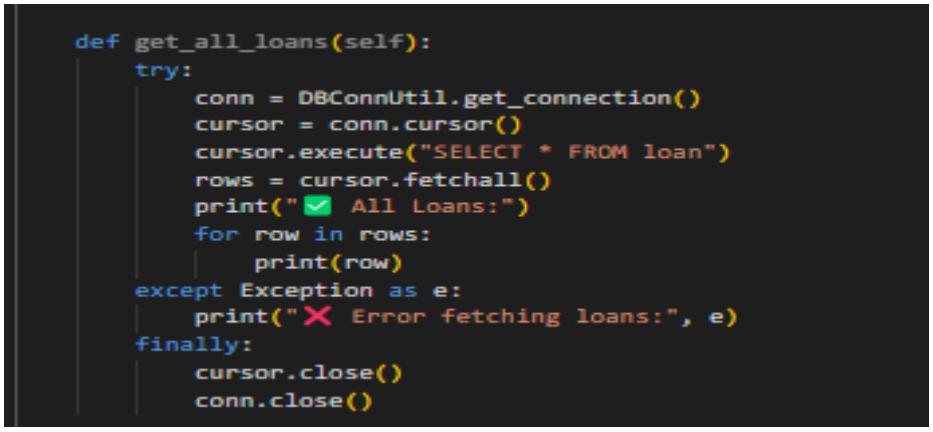
```
def loan_repayment(self, loan_id, amount):
        try:
            emi = self.calculate_emi(loan_id)
            if emi is None:
                return
            if amount < emi:
                print(" Payment amount is less than single EMI. Payment rejected.")
                return
            num_emis = int(amount // emi)
            print(f" Payment of ₹{amount:.2f} will cover {num_emis} EMI(s).")
        except Exception as e:
            print(" Error in repayment:", e)
```

```
def loan_repayment(self, loan_id, amount):
    try:
        emi = self.calculate_emi(loan_id)
        if emi is None:
            return
        if amount < emi:
            print("❌ Payment amount is less than single EMI. Payment rejected.")
            return
        num_emis = int(amount // emi)
        print(f"✅ Payment of ₹{amount:.2f} will cover {num_emis} EMI(s).")
    except Exception as e:
        print("❌ Error in repayment:", e)
```

f. getAllLoan(): get all loan as list and print the details.

Code:

```
def get_all_loans(self):
    try:
        conn = DBConnUtil.get_connection()
        cursor = conn.cursor()
        cursor.execute("SELECT * FROM loan")
        rows = cursor.fetchall()
        print(" All Loans:")
        for row in rows:
            print(row)
    except Exception as e:
        print(" Error fetching loans:", e)
    finally:
        cursor.close()
        conn.close()
```



```
def get_all_loans(self):
    try:
        conn = DBConnUtil.get_connection()
        cursor = conn.cursor()
        cursor.execute("SELECT * FROM loan")
        rows = cursor.fetchall()
        print("✅ All Loans:")
        for row in rows:
            print(row)
    except Exception as e:
        print("❌ Error fetching loans:", e)
    finally:
        cursor.close()
        conn.close()
```

g. getLoanById(loanId): get loan and print the details, if loan not found generate InvalidLoanException.

Code:

```
def get_loan_by_id(self, loan_id):
    try:
        conn = DBConnUtil.get_connection()
        cursor = conn.cursor()
        cursor.execute("SELECT * FROM loan WHERE loan_id = %s", (loan_id,))
        row = cursor.fetchone()
        if row:
            print(f" Loan Details for ID {loan_id}:")
            print(row)
            return row
        else:
            raise InvalidLoanException("Loan not found for ID: " + str(loan_id))
    except InvalidLoanException as e:
        print("X", e)
    finally:
        cursor.close()
        conn.close()
```

```
def get_loan_by_id(self, loan_id):
    try:
            conn = DBConnUtil.get_connection()
            cursor = conn.cursor()
            cursor.execute("SELECT * FROM loan WHERE loan_id = %s", (loan_id,))
            row = cursor.fetchone()
            if row:
                print(f"✅ Loan Details for ID {loan_id}:")
                print(row)
                return row
            else:
                raise InvalidLoanException("Loan not found for ID: " + str(loan_id))
    except InvalidLoanException as e:
        print("❌", e)
    finally:
        cursor.close()
        conn.close()
```

6. Define ILoanRepositoryImpl class and implement the ILoanRepository interface and provide implementation of all methods.

Code:

```
import mysql.connector

from dao.interface.i_loan_repository import ILoanRepository

from exception.invalid_loan_exception import InvalidLoanException

from util.db_conn_util import DBConnUtil

from entity.loan import Loan


class LoanRepositoryImpl(ILoanRepository):


  def apply_loan(self, loan):
    try:
      confirm = input("Do you want to apply for the loan? (Yes/No): ").strip().lower()
      if confirm != 'yes':
        print("Loan application cancelled.")
        return


      conn = DBConnUtil.get_connection()
      cursor = conn.cursor()
```

```
        query = """
            INSERT INTO loan (customer_id, principal_amount, interest_rate, loan_term, loan_type,
loan_status)
            VALUES (%s, %s, %s, %s, %s, %s)
        """
        values = (
            loan.get_customer().get_customer_id(),
            loan.get_principal_amount(),
            loan.get_interest_rate(),
            loan.get_loan_term(),
            loan.get_loan_type(),
            'Pending'
        )
        cursor.execute(query, values)
        conn.commit()
        print(" Loan application submitted successfully.")
    except Exception as e:
        print("X Error applying loan:", e)
    finally:
        cursor.close()
        conn.close()


def calculate_interest(self, loan_id):
    try:
        conn = DBConnUtil.get_connection()
        cursor = conn.cursor()
        cursor.execute("SELECT principal_amount, interest_rate, loan_term FROM loan WHERE
loan_id = %s", (loan_id,))
        row = cursor.fetchone()
        if row:
            principal, rate, term = row
            interest = (principal * rate * term) / 1200
```

```
            print(f" Interest for Loan ID {loan_id}: ₹{interest:.2f}")
            return interest
        else:
            raise InvalidLoanException("Loan not found for ID: " + str(loan_id))
    except InvalidLoanException as e:
        print("X", e)
    finally:
        cursor.close()
        conn.close()

    def calculate_interest_manual(self, principal, rate, term):
        interest = (principal * rate * term) / 1200
        print(f" Manual Interest: ₹{interest:.2f}")
        return interest

    def loan_status(self, loan_id):
        try:
            conn = DBConnUtil.get_connection()
            cursor = conn.cursor()
            cursor.execute("""
                SELECT c.credit_score FROM loan l
                JOIN customer c ON l.customer_id = c.customer_id
                WHERE l.loan_id = %s
            """, (loan_id,))
            row = cursor.fetchone()
            if row:
                credit_score = row[0]
                status = "Approved" if credit_score > 650 else "Rejected"
                cursor.execute("UPDATE loan SET loan_status = %s WHERE loan_id = %s", (status,
loan_id))
                conn.commit()
```

```
            print(f" Loan Status for Loan ID {loan_id}: {status}")
        else:
            raise InvalidLoanException("Loan not found for ID: " + str(loan_id))
    except InvalidLoanException as e:
        print("X", e)
    finally:
        cursor.close()
        conn.close()

def calculate_emi(self, loan_id):
    try:
        conn = DBConnUtil.get_connection()
        cursor = conn.cursor()
        cursor.execute("SELECT principal_amount, interest_rate, loan_term FROM loan WHERE
loan_id = %s", (loan_id,))
        row = cursor.fetchone()
        if row:
            P, R_annual, N = row
            R = R_annual / (12 * 100)  # monthly rate
            emi = (P * R * (1 + R) ** N) / ((1 + R) ** N - 1)
            print(f" EMI for Loan ID {loan_id}: ₹{emi:.2f}")
            return emi
        else:
            raise InvalidLoanException("Loan not found for ID: " + str(loan_id))
    except InvalidLoanException as e:
        print("X", e)
    finally:
        cursor.close()
        conn.close()

def calculate_emi_manual(self, principal, rate, term):
```

```
    R = rate / (12 * 100)
    emi = (principal * R * (1 + R) ** term) / ((1 + R) ** term - 1)
    print(f" Manual EMI: ₹{emi:.2f}")
    return emi

def loan_repayment(self, loan_id, amount):
    try:
        emi = self.calculate_emi(loan_id)
        if emi is None:
            return
        if amount < emi:
            print("Payment amount is less than single EMI. Payment rejected.")
            return
        num_emis = int(amount // emi)
        print(f" Payment of ₹{amount:.2f} will cover {num_emis} EMI(s).")
    except Exception as e:
        print("X Error in repayment:", e)

def get_all_loans(self):
    try:
        conn = DBConnUtil.get_connection()
        cursor = conn.cursor()
        cursor.execute("SELECT * FROM loan")
        rows = cursor.fetchall()
        print(" All Loans:")
        for row in rows:
            print(row)
    except Exception as e:
        print("X Error fetching loans:", e)
    finally:
        cursor.close()
```

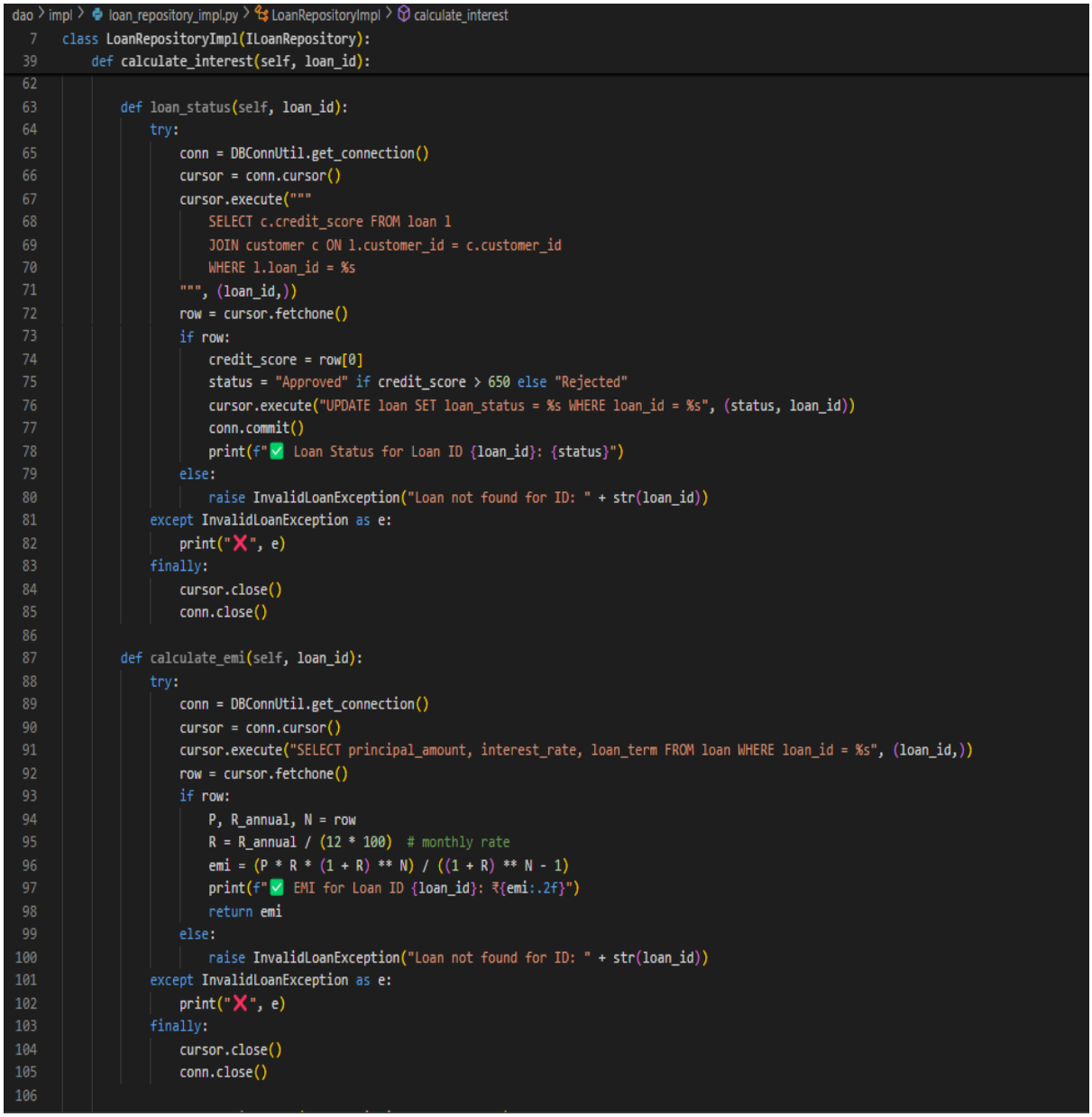
```
        conn.close()


def get_loan_by_id(self, loan_id):
    try:
            conn = DBConnUtil.get_connection()
            cursor = conn.cursor()
            cursor.execute("SELECT * FROM loan WHERE loan_id = %s", (loan_id,))
            row = cursor.fetchone()
            if row:
                print(f" Loan Details for ID {loan_id}:")
                print(row)
                return row
            else:
                raise InvalidLoanException("Loan not found for ID: " + str(loan_id))
    except InvalidLoanException as e:
        print("X", e)
    finally:
        cursor.close()
        conn.close()
```

dao > impl > loan_repository_impl.py > LoanRepositoryImpl > apply_loan

```python
import mysql.connector
from dao.interface.i_loan_repository import ILoanRepository
from exception.invalid_loan_exception import InvalidLoanException
from util.db_conn_util import DBConnUtil
from entity.loan import Loan

class LoanRepositoryImpl(ILoanRepository):

    def apply_loan(self, loan):
        try:
            confirm = input("Do you want to apply for the loan? (Yes/No): ").strip().lower()
            if confirm != 'yes':
                print("Loan application cancelled.")
                return

            conn = DBConnUtil.get_connection()
            cursor = conn.cursor()
            query = """
                INSERT INTO loan (customer_id, principal_amount, interest_rate, loan_term, loan_type, loan_status)
                VALUES (%s, %s, %s, %s, %s, %s)
            """
            values = (
                loan.get_customer().get_customer_id(),
                loan.get_principal_amount(),
                loan.get_interest_rate(),
                loan.get_loan_term(),
                loan.get_loan_type(),
                'Pending'
            )
            cursor.execute(query, values)
            conn.commit()
            print("✅ Loan application submitted successfully.")
        except Exception as e:
            print("❌ Error applying loan:", e)
        finally:
            cursor.close()
            conn.close()
```

dao > impl > loan_repository_impl.py > LoanRepositoryImpl > apply_loan

```python
class LoanRepositoryImpl(ILoanRepository):
    def calculate_interest(self, loan_id):
        try:
            conn = DBConnUtil.get_connection()
            cursor = conn.cursor()
            cursor.execute("SELECT principal_amount, interest_rate, loan_term FROM loan WHERE loan_id = %s", (loan_id,))
            row = cursor.fetchone()
            if row:
                principal, rate, term = row
                interest = (principal * rate * term) / 1200
                print(f"✅ Interest for Loan ID {loan_id}: ₹{interest:.2f}")
                return interest
            else:
                raise InvalidLoanException("Loan not found for ID: " + str(loan_id))
        except InvalidLoanException as e:
            print("❌", e)
        finally:
            cursor.close()
            conn.close()

        def calculate_interest_manual(self, principal, rate, term):
            interest = (principal * rate * term) / 1200
            print(f"✅ Manual Interest: ₹{interest:.2f}")
            return interest
```


dao > impl > loan_repository_impl.py > LoanRepositoryImpl > calculate_interest
class LoanRepositoryImpl(ILoanRepository):
def calculate_interest(self, loan_id):
def loan_status(self, loan_id):
try:
conn = DBConnUtil.get_connection()
cursor = conn.cursor()
cursor.execute("""
SELECT c.credit_score FROM loan l
JOIN customer c ON l.customer_id = c.customer_id
WHERE l.loan_id = %s
""", (loan_id,))
row = cursor.fetchone()
if row:
credit_score = row[0]
status = "Approved" if credit_score > 650 else "Rejected"
cursor.execute("UPDATE loan SET loan_status = %s WHERE loan_id = %s", (status, loan_id))
conn.commit()
print(f"✅ Loan Status for Loan ID {loan_id}: {status}")
else:
raise InvalidLoanException("Loan not found for ID: " + str(loan_id))
except InvalidLoanException as e:
print("❌", e)
finally:
cursor.close()
conn.close()
def calculate_emi(self, loan_id):
try:
conn = DBConnUtil.get_connection()
cursor = conn.cursor()
cursor.execute("SELECT principal_amount, interest_rate, loan_term FROM loan WHERE loan_id = %s", (loan_id,))
row = cursor.fetchone()
if row:
P, R_annual, N = row
R = R_annual / (12 * 100) # monthly rate
emi = (P * R * (1 + R) ** N) / ((1 + R) ** N - 1)
print(f"✅ EMI for Loan ID {loan_id}: ₹{emi:.2f}")
return emi
else:
raise InvalidLoanException("Loan not found for ID: " + str(loan_id))
except InvalidLoanException as e:
print("❌", e)
finally:
cursor.close()
conn.close()

dao > impl > loan_repository_impl.py > LoanRepositoryImpl > calculate_interest > loan_status

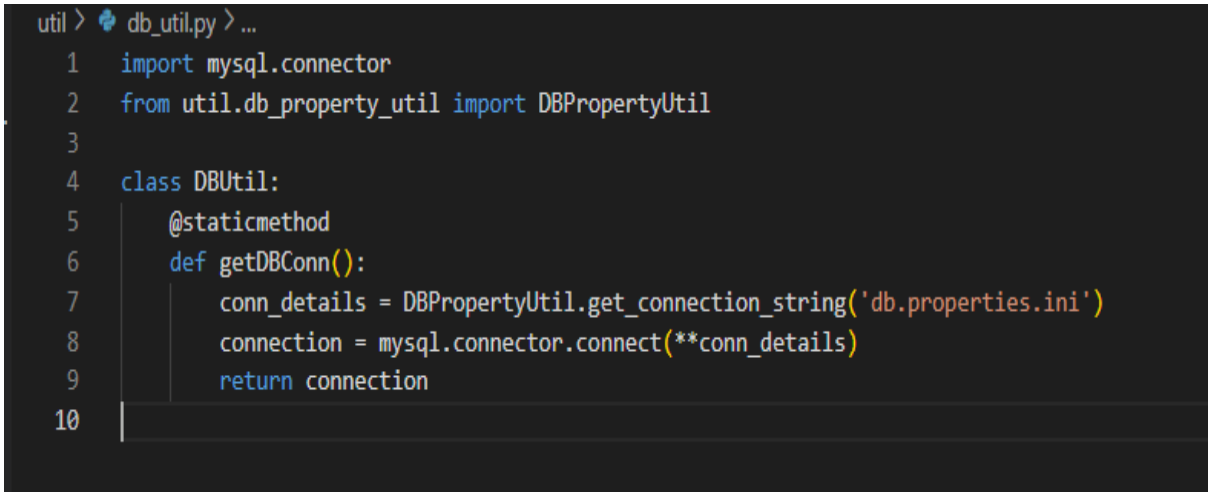
```
7   class LoanRepositoryImpl(ILoanRepository):
39      def calculate_interest(self, loan_id):
106
107         def calculate_emi_manual(self, principal, rate, term):
108             R = rate / (12 * 100)
109             emi = (principal * R * (1 + R) ** term) / ((1 + R) ** term - 1)
110             print(f"✅ Manual EMI: ₹{emi:.2f}")
111             return emi
112
113         def loan_repayment(self, loan_id, amount):
114             try:
115                 emi = self.calculate_emi(loan_id)
116                 if emi is None:
117                     return
118                 if amount < emi:
119                     print("❌ Payment amount is less than single EMI. Payment rejected.")
120                     return
121                 num_emis = int(amount // emi)
122                 print(f"✅ Payment of ₹{amount:.2f} will cover {num_emis} EMI(s).")
123             except Exception as e:
124                 print("❌ Error in repayment:", e)
125
126         def get_all_loans(self):
127             try:
128                 conn = DBConnUtil.get_connection()
129                 cursor = conn.cursor()
130                 cursor.execute("SELECT * FROM loan")
131                 rows = cursor.fetchall()
132                 print("✅ All Loans:")
133                 for row in rows:
134                     print(row)
135             except Exception as e:
136                 print("❌ Error fetching loans:", e)
137             finally:
138                 cursor.close()
139                 conn.close()
140
141         def get_loan_by_id(self, loan_id):
142             try:
143                     conn = DBConnUtil.get_connection()
144                     cursor = conn.cursor()
145                     cursor.execute("SELECT * FROM loan WHERE loan_id = %s", (loan_id,))
146                     row = cursor.fetchone()
147                     if row:
148                         print(f"✅ Loan Details for ID {loan_id}:")
149                         print(row)
150                         return row
151                     else:
152                         raise InvalidLoanException("Loan not found for ID: " + str(loan_id))
153             except InvalidLoanException as e:
154                 print("❌", e)
155             finally:
156                 cursor.close()
157                 conn.close()
158
```

7. Create DBUtil class and add the following method.

a. static getDBConn():Connection Establish a connection to the database and return Connection reference

Code:

```
import mysql.connector

from util.db_property_util import DBPropertyUtil


class DBUtil:

    @staticmethod

    def getDBConn():

        conn_details = DBPropertyUtil.get_connection_string('db.properties.ini')

        connection = mysql.connector.connect(**conn_details)

        return connection
```



8. Create LoanManagement main class and perform following operation:

a. main method to simulate the loan management system. Allow the user to interact with the system by entering choice from menu such as "applyLoan", "getAllLoan", "getLoan", "loanRepayment", "exit."

Code:

```
import sys
import os
sys.path.append(os.path.abspath(os.path.join(os.path.dirname(__file__), '..')))

from dao.impl.loan_repository_impl import LoanRepositoryImpl
from entity.loan import Loan
from entity.customer import Customer

def show_menu():
    print("\n==== Loan Management System ====")
    print("1. Apply for a Loan")
    print("2. View All Loans")
    print("3. View Loan by ID")
    print("4. Calculate Interest")
    print("5. Calculate EMI")
    print("6. Make Loan Repayment")
    print("7. Update Loan Status")
    print("0. Exit")
    return input("Enter your choice: ")

def main():
    repo = LoanRepositoryImpl()

    while True:
        choice = show_menu()
```

```
    if choice == '1':
        customer_id = input("Enter Customer ID: ")
        principal = float(input("Enter Principal Amount: "))
        rate = float(input("Enter Interest Rate: "))
        term = int(input("Enter Loan Term (in months): "))
        loan_type = input("Enter Loan Type (HomeLoan/CarLoan): ")

        # Basic customer object just for relation
        customer = Customer(customer_id=customer_id, name="", email="", phone="", address="",
credit_score=700)
        loan = Loan(loan_id=None, customer=customer, principal_amount=principal,
                interest_rate=rate, loan_term=term, loan_type=loan_type, loan_status="Pending")

        repo.apply_loan(loan)

    elif choice == '2':
        repo.get_all_loans()

    elif choice == '3':
        loan_id = input("Enter Loan ID: ")
        repo.get_loan_by_id(loan_id)

    elif choice == '4':
        loan_id = input("Enter Loan ID: ")
        repo.calculate_interest(loan_id)

    elif choice == '5':
        loan_id = input("Enter Loan ID: ")
        repo.calculate_emi(loan_id)

    elif choice == '6':
```

```
            loan_id = input("Enter Loan ID: ")
            amount = float(input("Enter Repayment Amount: "))
            repo.loan_repayment(loan_id, amount)

        elif choice == '7':
            loan_id = input("Enter Loan ID to update status: ")
            repo.loan_status(loan_id)

        elif choice == '0':
            print(" Exiting Loan Management System.")
            break

        else:
            print(" Invalid choice. Please try again.")

if __name__ == "__main__":
    main()
```

```python
import sys
import os
sys.path.append(os.path.abspath(os.path.join(os.path.dirname(__file__), '..')))

from dao.impl.loan_repository_impl import LoanRepositoryImpl
from entity.loan import Loan
from entity.customer import Customer

def show_menu():
    print("\n==== Loan Management System ====")
    print("1. Apply for a Loan")
    print("2. View All Loans")
    print("3. View Loan by ID")
    print("4. Calculate Interest")
    print("5. Calculate EMI")
    print("6. Make Loan Repayment")
    print("7. Update Loan Status")
    print("0. Exit")
    return input("Enter your choice: ")

def main():
    repo = LoanRepositoryImpl()

    while True:
        choice = show_menu()

        if choice == '1':
            customer_id = input("Enter Customer ID: ")
            principal = float(input("Enter Principal Amount: "))
            rate = float(input("Enter Interest Rate: "))
            term = int(input("Enter Loan Term (in months): "))
            loan_type = input("Enter Loan Type (HomeLoan/CarLoan): ")

            # Basic customer object just for relation
            customer = Customer(customer_id=customer_id, name="", email="", phone="", address="", credit_score=700)
            loan = Loan(loan_id=None, customer=customer, principal_amount=principal,
                        interest_rate=rate, loan_term=term, loan_type=loan_type, loan_status="Pending")

            repo.apply_loan(loan)

        elif choice == '2':
            repo.get_all_loans()

        elif choice == '3':
            loan_id = input("Enter Loan ID: ")
            repo.get_loan_by_id(loan_id)
```

```
        elif choice == '4':
            loan_id = input("Enter Loan ID: ")
            repo.calculate_interest(loan_id)

        elif choice == '5':
            loan_id = input("Enter Loan ID: ")
            repo.calculate_emi(loan_id)

        elif choice == '6':
            loan_id = input("Enter Loan ID: ")
            amount = float(input("Enter Repayment Amount: "))
            repo.loan_repayment(loan_id, amount)

        elif choice == '7':
            loan_id = input("Enter Loan ID to update status: ")
            repo.loan_status(loan_id)

        elif choice == '0':
            print("👋 Exiting Loan Management System.")
            break

        else:
            print("❌ Invalid choice. Please try again.")

if __name__ == "__main__":
    main()
```

OUTPUT:

1.APPLY FOR A LOAN

```
==== Loan Management System ====
1. Apply for a Loan
2. View All Loans
3. View Loan by ID
4. Calculate Interest
5. Calculate EMI
6. Make Loan Repayment
7. Update Loan Status
0. Exit
Enter your choice: 1
Enter Customer ID: 4
Enter Principal Amount: 300000
Enter Interest Rate: 8.5
Enter Loan Term (in months): 30
Enter Loan Type (HomeLoan/CarLoan): CarLoan
Do you want to apply for the loan? (Yes/No): Yes
✅ Loan application submitted successfully.

==== Loan Management System ====
1. Apply for a Loan
2. View All Loans
3. View Loan by ID
4. Calculate Interest
5. Calculate EMI
6. Make Loan Repayment
7. Update Loan Status
0. Exit
Enter your choice: 1
Enter Customer ID: 5
Enter Principal Amount: 9000000
Enter Interest Rate: 9.3
Enter Loan Term (in months): 36
Enter Loan Type (HomeLoan/CarLoan): HomeLoan
Do you want to apply for the loan? (Yes/No): Yes
✅ Loan application submitted successfully.
```

2. VIEW ALL LOANS

```
==== Loan Management System ====
1. Apply for a Loan
2. View All Loans
3. View Loan by ID
4. Calculate Interest
5. Calculate EMI
6. Make Loan Repayment
7. Update Loan Status
0. Exit
Enter your choice: 2
✅ All Loans:
(104, 2, Decimal('120000.00'), Decimal('9.50'), 24, 'CarLoan', 'Pending')
(105, 2, Decimal('20000.00'), Decimal('9.20'), 30, 'HomeLoan', 'Pending')
(106, 3, Decimal('300000.00'), Decimal('7.20'), 20, 'CarLoan', 'Pending')
(107, 4, Decimal('300000.00'), Decimal('8.50'), 30, 'CarLoan', 'Pending')
(108, 5, Decimal('9000000.00'), Decimal('9.30'), 36, 'HomeLoan', 'Pending')
```

3. VIEW LOAN BY ID

```
==== Loan Management System ====
1. Apply for a Loan
2. View All Loans
3. View Loan by ID
4. Calculate Interest
5. Calculate EMI
6. Make Loan Repayment
7. Update Loan Status
0. Exit
Enter your choice: 3
Enter Loan ID: 104
✅ Loan Details for ID 104:
(104, 2, Decimal('120000.00'), Decimal('9.50'), 24, 'CarLoan', 'Pending')
```

4. CALCULATE INTEREST

```
==== Loan Management System ====
1. Apply for a Loan
2. View All Loans
3. View Loan by ID
4. Calculate Interest
5. Calculate EMI
6. Make Loan Repayment
7. Update Loan Status
0. Exit
Enter your choice: 4
Enter Loan ID: 104
✅ Interest for Loan ID 104: ₹22800.00
```

5. CALCULATE EMI

```
==== Loan Management System ====
1. Apply for a Loan
2. View All Loans
3. View Loan by ID
4. Calculate Interest
5. Calculate EMI
6. Make Loan Repayment
7. Update Loan Status
0. Exit
Enter your choice: 5
Enter Loan ID: 104
✅ EMI for Loan ID 104: ₹5509.74
```

6. LOAN REPAYMENT

```
==== Loan Management System ====
1. Apply for a Loan
2. View All Loans
3. View Loan by ID
4. Calculate Interest
5. Calculate EMI
6. Make Loan Repayment
7. Update Loan Status
0. Exit
Enter your choice:
Enter your choice: 6
Enter Repayment Amount: 12000
✅ EMI for Loan ID 104: ₹5509.74
✅ Payment of ₹12000.00 will cover 2 EMI(s).
```

7.UPDATE LOAN STATUS

```
==== Loan Management System ====
1. Apply for a Loan
2. View All Loans
3. View Loan by ID
4. Calculate Interest
5. Calculate EMI
6. Make Loan Repayment
7. Update Loan Status
0. Exit
Enter your choice:
Enter your choice: 7
Enter Loan ID to update status: 104
✅ Loan Status for Loan ID 104: Rejected
```