DSA Mini Project

Group J:

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Program Question:

System that automates loan processing tasks, including loan eligibility checking, interest estimation, and repayment scheduling.

Programing Language: C

Library used:

- **<stdio.h>**
- **<math.h>**

Features :

- **Automated Eligibility Check:** Instantly approves or rejects loans based on Credit Score (must be >650) and Debt-to-Income Ratio (must be <50%).
- **EMI Calculator**: Computes the exact monthly installment using the standard compound interest formula.
- **Financial Summary**: Provides a snapshot showing the Total Interest Cost and total amount payable before showing detailed logs.
- **Amortization Schedule**: Generates a detailed, month-by-month repayment table showing how the Principal vs. Interest balance changes over time.
- **Input Validation**: Basic handling to ensure negative loan balances are corrected to zero in the final month

Source Code:

```
#include <stdio.h>
#include <math.h>

typedef struct {
    char name[50];
    double monthlyIncome;
    double currentDebt;
    int creditScore;
} Applicant;

typedef struct {
    double principal;
    double annualRate;
    int tenureMonths;
} LoanRequest;

double calculateEMI(double principal, double annualRate, int months);
int checkEligibility(Applicant user, double estimatedEMI);
void displayLoanSummary(double principal, int tenureMonths, double emi);
void generateRepaymentSchedule(double principal, double monthlyRate, int months, double emi);

int main() {
    Applicant user;
    LoanRequest loan;

    printf("=== LOAN PROCESSING SYSTEM ===\n");
    printf("--- Applicant Details ---\n");
    printf("Enter Name: ");
    scanf("%s", user.name);
    printf("Enter Monthly Income: ");
    scanf("%lf", &user.monthlyIncome);
    printf("Enter Current Monthly Debt/EMIs: ");
    scanf("%lf", &user.currentDebt);
    printf("Enter Credit Score (300-900): ");
    scanf("%d", &user.creditScore);
```

```c

    printf("\n--- Loan Request Details ---\n");
    printf("Enter Loan Amount (Principal): ");
    scanf("%lf", &loan.principal);
    printf("Enter Annual Interest Rate (%%): ");
    scanf("%lf", &loan.annualRate);
    printf("Enter Tenure (Months): ");
    scanf("%d", &loan.tenureMonths);

    double emi = calculateEMI(loan.principal, loan.annualRate, loan.tenureMonths);

    if (checkEligibility(user, emi)) {
        printf("\n[STATUS] Congratulations %s, your loan is APPROVED.\n", user.name);

        displayLoanSummary(loan.principal, loan.tenureMonths, emi);

        char choice;
        printf("\nWould you like to see the month-by-month repayment schedule? (y/n): ");
        scanf(" %c", &choice);

        if(choice == 'y' || choice == 'Y') {
            double monthlyRate = loan.annualRate / 12.0 / 100.0;
            generateRepaymentSchedule(loan.principal, monthlyRate, loan.tenureMonths, emi);
        }
    } else {
        printf("\n[STATUS] Loan REJECTED.\n");
        printf("Reason: High Debt-to-Income ratio or low Credit Score.\n");
    }

    return 0;
}

```

```c
double calculateEMI(double principal, double annualRate, int months) {
    double monthlyRate = annualRate / 12.0 / 100.0;
    double growth = pow(1 + monthlyRate, months);
    return (principal * monthlyRate * growth) / (growth - 1);
}

int checkEligibility(Applicant user, double estimatedEMI) {
    if (user.creditScore < 650) return 0;

    double totalObligation = user.currentDebt + estimatedEMI;
    double maxAllowedDebt = user.monthlyIncome * 0.50;

    if (totalObligation > maxAllowedDebt) return 0;

    return 1;
}

void displayLoanSummary(double principal, int tenureMonths, double emi) {
    double totalAmountPayable = emi * tenureMonths;
    double totalInterest = totalAmountPayable - principal;

    printf("\n--- FINANCIAL SUMMARY ---\n");
    printf("Loan Amount:         $%.2f\n", principal);
    printf("Monthly EMI:         $%.2f\n", emi);
    printf("Total Repayment:     $%.2f\n", totalAmountPayable);
    printf("-----------------------------\n");
    printf("TOTAL INTEREST COST: $%.2f\n", totalInterest);
    printf("-----------------------------\n");
}
```

```c

void generateRepaymentSchedule(double principal, double monthlyRate, int months, double emi) {
    double balance = principal;
    double totalInterestPaid = 0;

    printf("\n%-8s %-12s %-12s %-12s %-12s\n", "Month", "EMI", "Interest", "Principal", "Balance");
    printf("----------------------------------------------------------------\n");

    for (int i = 1; i <= months; i++) {
        double interestPart = balance * monthlyRate;
        double principalPart = emi - interestPart;

        balance = balance - principalPart;
        if (balance < 0) balance = 0;

        printf("%-8d %-12.2f %-12.2f %-12.2f %-12.2f\n",
               i, emi, interestPart, principalPart, balance);
    }
}
```

Code Explanation:

The code automates loan processing by organizing data into C structures: one for the Applicant (income, credit score) and one for the LoanRequest (principal, rate). The program first captures user input and calculates the Equated Monthly Installment (EMI) using the standard compound interest formula via the pow() function.

Crucially, a checkEligibility function acts as a gatekeeper. It validates the loan only if the user's credit score exceeds 650 and their total debt obligations (including the new EMI) remain below 50% of their monthly income.

Upon approval, the system calculates the total interest cost and executes a for loop to generate an amortization schedule. In each iteration of this loop, the program separates the interest portion from the principal repayment, updates the remaining balance, and prints a formatted row. This results in a clear, month-by-month financial breakdown of the entire loan lifecycle.

Output:

```
=== LOAN PROCESSING SYSTEM ===
--- Applicant Details ---
Enter Name: Satyam
Enter Monthly Income: 60000
Enter Current Monthly Debt/EMIs: 4000
Enter Credit Score (300-900): 820

--- Loan Request Details ---
Enter Loan Amount (Principal): 10000
Enter Annual Interest Rate (%): 5
Enter Tenure (Months): 24

[STATUS] Congratulations Satyam, your loan is APPROVED.

--- FINANCIAL SUMMARY ---
Loan Amount:         $10000.00
Monthly EMI:         $438.71
Total Repayment:     $10529.13
-----------------------------
TOTAL INTEREST COST: $529.13
-----------------------------
```

```
Would you like to see the month-by-month repayment schedule? (y/n): Y

Month    EMI          Interest     Principal    Balance
-----------------------------------------------------------------
1        438.71       41.67        397.05       9602.95
2        438.71       40.01        398.70       9204.25
3        438.71       38.35        400.36       8803.89
4        438.71       36.68        402.03       8401.86
5        438.71       35.01        403.71       7998.15
6        438.71       33.33        405.39       7592.76
7        438.71       31.64        407.08       7185.69
8        438.71       29.94        408.77       6776.91
9        438.71       28.24        410.48       6366.44
10       438.71       26.53        412.19       5954.25
11       438.71       24.81        413.90       5540.34
12       438.71       23.08        415.63       5124.71
13       438.71       21.35        417.36       4707.35
14       438.71       19.61        419.10       4288.25
15       438.71       17.87        420.85       3867.41
16       438.71       16.11        422.60       3444.81
17       438.71       14.35        424.36       3020.45
18       438.71       12.59        426.13       2594.32
19       438.71       10.81        427.90       2166.41
20       438.71       9.03         429.69       1736.73
21       438.71       7.24         431.48       1305.25
22       438.71       5.44         433.28       871.97
23       438.71       3.63         435.08       436.89
24       438.71       1.82         436.89       0.00
```