1. main.c

```
#include <stdio.h>
#include "header.h"
#include <string.h>
#include <stdlib.h>

#define MAX_NUMBERS 1000

int main(){
   int question;
   printf("Enter Question Number: ");
   scanf("%d", &question);
   /*
      Clear the input buffer to handle the newline character after scanf("%d", &question)
   */
   getchar();
   switch(question){
      case 1:{
         student students[MAX_NUMBERS];
         int numStudents = 0;

         printf("Enter the number of students: ");
         scanf("%d", &numStudents);
         getchar();
         for (int i = 0; i < numStudents; i++) {
            printf("\nEnter details for student %d:\n", i + 1);

            printf("Roll Number: ");
            scanf("%d", &students[i].rollno);
            getchar();
            printf("First Name: ");
```

```
            scanf("%s", students[i].name.firstName);

            printf("Middle Name: ");
            scanf("%s", students[i].name.middleName);

            printf("Last Name: ");
            scanf("%s", students[i].name.lastName);

            printf("Gender: ");
            scanf("%s", students[i].gender);

            printf("Date of Birth (dd mm yyyy): ");
            scanf("%d %d %d", &students[i].dob.day, &students[i].dob.month, &students[i].dob.year);

            printf("Marks (Mathematics Science Computer Science): ");
            scanf("%d %d %d", &students[i].marks.maths, &students[i].marks.science,
&students[i].marks.computerScience);
        }
        printf("\n");
        for (int i = 0; i < numStudents; i++) {
            float aggregatePercentage = calculateAggregatePercentage(&students[i]);
            if (aggregatePercentage < 40) {
                printf("This student has less than 40%% aggregate and aggregate marks are %f:\n",
aggregatePercentage);
                displayStudent(&students[i]);
            }
            printf("\n");
        }
        break;
    }
    case 2:{
        hotel hotels[MAX_NUMBERS];
```

```
int numHotels = 0;
printf("Enter the number of hotels: ");
scanf("%d", &numHotels);
getchar();
for (int i = 0; i < numHotels; i++) {
   printf("\nEnter details for hotel %d:\n", i + 1);
   printf("Hotel Name: ");
   scanf("%[^\n]s", hotels[i].name);
   getchar();
   printf("Address: ");
   scanf("%[^\n]s", hotels[i].address);
   printf("Grade: ");
   scanf("%d", &hotels[i].grade);
   printf("Number Of Rooms: ");
   scanf("%d", &hotels[i].number_of_rooms);
   printf("Room Charges: ");
   scanf("%d", &hotels[i].room_charges);
   getchar();
}
int g;
printf("Enter the grade of which hotels you want:");
scanf("%d", &g);
for(int i = 0; i < numHotels; i++){
   hotelsInParticularGrade(&hotels[i], g);
}
int value;
printf("Enter the value below which rooms in hotels you want:");
scanf("%d", &value);
for(int i = 0; i < numHotels; i++){
   hotelsOfParticularValue(&hotels[i], value);
}
```

```
        break;
    }
    case 3:{
        time start_time, end_time;
        printf("Enter start time (hr min sec): ");
        scanf("%d %d %d", &start_time.hr, &start_time.min, &start_time.sec);
        printf("Enter end time (hr min sec): ");
        scanf("%d %d %d", &end_time.hr, &end_time.min, &end_time.sec);

        printf("\n");
        while (!(start_time.hr == end_time.hr && start_time.min == end_time.min && start_time.sec
== end_time.sec)) {
            printf("GOOD DAY\n");
            increment_time(&start_time);
        }
        break;
    }
    case 4:{
        fraction f1, f2;
        printf("Enter numerator and denominator of the first fraction: ");
        scanf("%d %d", &f1.numerator, &f1.denominator);
        printf("Enter numerator and denominator of the second fraction: ");
        scanf("%d %d", &f2.numerator, &f2.denominator);
        int result = compareFractions(f1, f2);
        if (result == 0) {
            printf("The two fractions are equal.\n");
        } else if (result == -1) {
            printf("The first fraction is less than the second fraction.\n");
        } else {
            printf("The first fraction is greater than the second fraction.\n");
        }
```

```
            break;
        }
        case 5:{
            date d;
            printf("Enter the date (dd mm yyyy): ");
            scanf("%d %d %d", &d.day, &d.month, &d.year);
            if (validateDate(&d)) {
                printf("The date is: %d/%d/%d valid\n", d.day, d.month, d.year);
            } else {
                printf("Invalid date entered!\n");
            }
            break;
        }
        case 6:{
            time t1, t2;
            printf("Enter t1 (hr min sec): ");
            scanf("%d %d %d", &t1.hr, &t1.min, &t1.sec);
            printf("Enter t2 (hr min sec): ");
            scanf("%d %d %d", &t2.hr, &t2.min, &t2.sec);
            time sum = addTime(t1, t2);
            time difference = subtractTime(t1, t2);
            printf("Sum: %d:%d:%d\n", sum.hr, sum.min, sum.sec);
            printf("Difference: %d:%d:%d\n", difference.hr, difference.min, difference.sec);
            break;
        }
        default:
            break;
    }
    return 0;

}
```

2. header.h

```
typedef struct student{
   int rollno;
   struct name{
      char firstName[20];
      char middleName[20];
      char lastName[20];
   }name;
   char gender[15];
   struct dob{
      int day;
      int month;
      int year;
   }dob;
   struct marks{
      int maths;
      int science;
      int computerScience;
   }marks;
}student;

typedef struct hotel{
   char name[50];
   char address[100];
   int grade;
   int number_of_rooms;
   int room_charges;
}hotel;

typedef struct time{
   int hr;
```

```
    int min;
    int sec;
}time;

typedef struct fraction{
    int numerator;
    int denominator;
}fraction;

typedef struct date{
    int year;
    int month;
    int day;
}date;

void displayStudent(const student *s);
float calculateAverage(const student *s);
float calculateAggregatePercentage(const student *s);
void hotelsInParticularGrade(const hotel *h, int grade);
void hotelsOfParticularValue(const hotel *h, int value);
void increment_time(time *t);
int compareFractions(fraction f1, fraction f2);
int isLeapYear(int year);
int validateDate(date *d);
time addTime(time t1, time t2);
time subtractTime(time t1, time t2);
```

3. logic.c

```
#include <stdio.h>
#include "header.h"
#include <string.h>
#include <stdlib.h>

void displayStudent(const student *s){
   printf("Roll Number: %d\n", s->rollno);
   printf("Name: %s %s %s\n", s->name.firstName, s->name.middleName, s->name.lastName);
   printf("Gender: %s\n", s->gender);
   printf("Date of Birth: %02d/%02d/%04d\n", s->dob.day, s->dob.month, s->dob.year);
   printf("Marks:\n");
   printf("  Mathematics: %d\n", s->marks.maths);
   printf("  Science: %d\n", s->marks.science);
   printf("  Computer Science: %d\n", s->marks.computerScience);
}

float calculateAverage(const student *s){
   return (s->marks.maths + s->marks.science + s->marks.computerScience) / 3.0;
}

float calculateAggregatePercentage(const student *s){
   int totalMarks = s->marks.maths + s->marks.science + s->marks.computerScience;
   return (totalMarks / 300.0) * 100;
}

void hotelsInParticularGrade(const hotel *h, int grade){
   if (h->grade == grade){
      printf("Hotel Name: %s\n", h->name);
   }
}
```

```
void hotelsOfParticularValue(const hotel *h, int value){
    if(h->room_charges < value){
        printf("Hotel Name: %s\n", h->name);
    }
}
void increment_time(time *t){
    t->sec++;
    if (t->sec == 60) {
        t->sec = 0;
        t->min++;
        if (t->min == 60) {
            t->min = 0;
            t->hr++;
            if (t->hr == 24) {
                t->hr = 0;
            }
        }
    }
}

int compareFractions(fraction f1, fraction f2){
    float value1 = (float)f1.numerator / f1.denominator;
    float value2 = (float)f2.numerator / f2.denominator;
    if (value1 == value2) {
        return 0;
    } else if (value1 < value2) {
        return -1;
    } else {
        return 1;
    }
}
```

```
int isLeapYear(int year){
   if(year % 400 == 0){
      return 1;
   }
   if(year % 100 == 0){
      return 0;
   }
   if(year % 4 == 0){
      return 1;
   }
   return 0;
}

int validateDate(date *d){
    if (d->month < 1 || d->month > 12) {
      return 0;
   }
   int daysInMonth[] = {31, 28, 31, 30, 31, 30, 31, 31, 30, 31, 30, 31};
   if (d->month == 2 && isLeapYear(d->year)) {
      daysInMonth[1] = 29;
   }
   if (d->day < 1 || d->day > daysInMonth[d->month - 1]) {
      return 0;
   }
   return 1;
}

time addTime(time t1, time t2){
   time result;
   result.sec = t1.sec + t2.sec;
```

```
    result.min = t1.min + t2.min + (result.sec / 60);
    result.sec %= 60;
    result.hr = t1.hr + t2.hr + (result.min / 60);
    result.min %= 60;
    return result;
}
time subtractTime(time t1, time t2){
    time result;
    result.sec = t1.sec - t2.sec;
    result.min = t1.min - t2.min;
    result.hr = t1.hr - t2.hr;
    if (result.sec < 0) {
        result.sec += 60;
        result.min--;
    }
    if (result.min < 0) {
        result.min += 60;
        result.hr--;
    }
    return result;
}
```

Outputs of Structure Assignment:

```
This student has less than 40% aggregate and aggregate marks are 23.333334:
Roll Number: 612303101
Name: xyz abc def
Gender: FEMALE
Date of Birth: 01/01/2005
Marks:
  Mathematics: 20
  Science: 30
  Computer Science: 20


E:\COEP\DSA\Assignments\StructuresAssignment>a
Enter Question Number: 2
Enter the number of hotels: 2

Enter details for hotel 1:
Hotel Name: 360 degree
Address: Deccan, Pune
Grade: 5
Number Of Rooms: 20
Room Charges: 2500

Enter details for hotel 2:
Hotel Name: RoofTop
Address: Shivajinagar
Grade: 3
Number Of Rooms: 10
Room Charges: 5000
Enter the grade of which hotels you want:3
Hotel Name: RoofTop
Enter the value below which rooms in hotels you want:4000
Hotel Name: 360 degree
```

```
E:\COEP\DSA\Assignments\StructuresAssignment>a
Enter Question Number: 3
Enter start time (hr min sec): 11 59 40
Enter end time (hr min sec): 12 00 00

GOOD DAY
GOOD DAY
GOOD DAY
GOOD DAY
GOOD DAY
GOOD DAY
GOOD DAY
GOOD DAY
GOOD DAY
GOOD DAY
GOOD DAY
GOOD DAY
GOOD DAY
GOOD DAY
GOOD DAY
GOOD DAY
GOOD DAY
GOOD DAY
GOOD DAY
GOOD DAY
```

```
E:\COEP\DSA\Assignments\StructuresAssignment>a
Enter Question Number: 4
Enter numerator and denominator of the first fraction: 35 60
Enter numerator and denominator of the second fraction: 49 84
The two fractions are equal.

E:\COEP\DSA\Assignments\StructuresAssignment>a
Enter Question Number: 5
Enter the date (dd mm yyyy): 30 02 2024
Invalid date entered!

E:\COEP\DSA\Assignments\StructuresAssignment>a
Enter Question Number: 6
Enter t1 (hr min sec): 05 23 45
Enter t2 (hr min sec): 04 16 15
Sum: 9:40:0
Difference: 1:7:30
```