National University of Computer & Emerging Sciences, Karachi
FAST-NUCES BSCS, BSSE, BSAI, BSCY, BSBA
Fall-2023 Midterm-I
25th September 2023, 10:00 am – 11:00am

SOLUTION PAPER

Course Code: CS1002	**Course Name:** Programming Fundamentals
Instructor Name: Mr. M. Shahzad, Dr. Farooque, Dr. Abdul Aziz, Mr. Zain, Mr. Basit, Ms. Sobia, Mr. Farooq Zaidi, Mr. M. Kariz	
Student Roll No:	**Section:**

Instructions:

- Return the question paper and make sure to keep it inside your answer sheet.
- Read each question completely before answering it. There are **three questions and two pages (front plus back)**.
- In case of any ambiguity, you may make assumption. However, your assumption should not contradict any statement in the question paper.
- Do not write anything on the question paper (except your ID and group).

Total Time: 1 Hour **Max Points:** 60

Question#1: Draw the PAC and Flowchart of the following task: [12 points, CLO1, 15 mins]

Description:

Your task is to create a flowchart & PAC to help students calculate their grades and provide an analysis based on their scores.

Requirements:

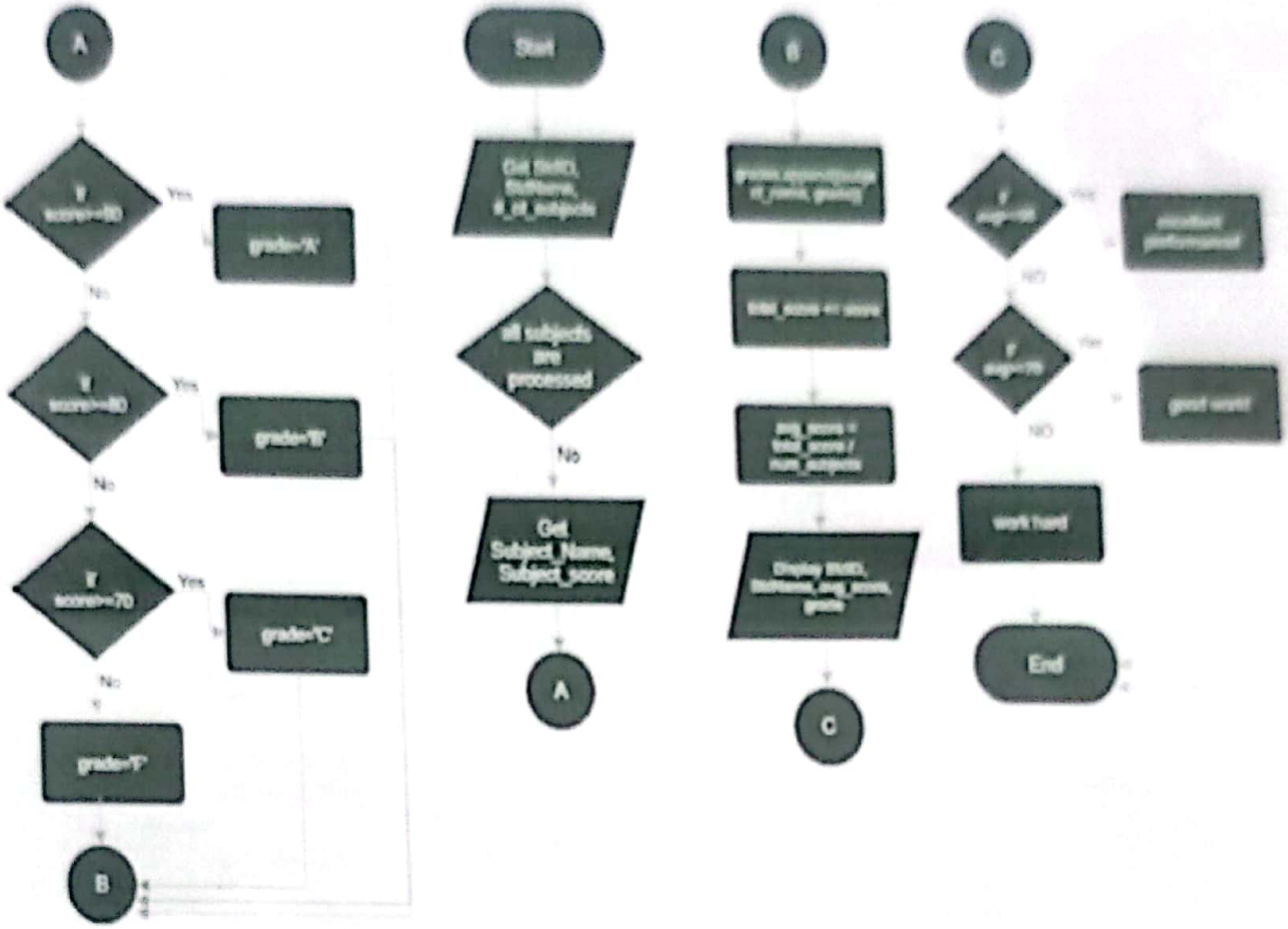
1. Prompt the student to enter their name and student ID.
2. Ask the student to input the number of subjects they want to calculate grades for (e.g., 5 subjects).
3. Repeat for each subject:
   - Prompt the student to enter the subject name.
   - Prompt the student to enter their score for that subject.
   - Use a decision statement to determine their grade based on the score (e.g., A, B, C, D, or F).
4. Calculate the average grade for all subjects.
5. Display the student's name, student ID, grades for each subject, and the average grade.
6. Use a decision statement to provide feedback based on the average grade:
   - If the average grade is A or B, display a message congratulating the student on their excellent performance.
   - If the average grade is C, provide an encouraging message for improvement.
   - If the average grade is D or F, express concern and suggest seeking help or studying harder.

Solution:

PAC

DATA	PROCESSING	OUTPUT
StdName, StdID, #_of_subjects, Subject_name, Subject_score	Sum of scores Append_grades Calculate avg Analyzing_performance	StdID, StdName, Grades_for_n_Subjects, avg_grade, provode_feedback

Flowchart:



Question#2: **[16 points, CLO1, 20 mins]**

Scenario: Imagine you have been hired by Science Exhibition to develop ticket reservation system for them. The Exhibition has three categories: regular seats, VIP seats, and premium seats. The ticket prices vary based on the seat type and the age of the person booking the ticket.

The pricing rules are as follows:

- Adults: Age 16-64 & seniors: Age 65 and above.
- Regular seats cost Rs. 800 for adults and Rs. 700 for seniors.
- VIP seats cost Rs. 1000 for adults and Rs. 900 for seniors.
- Premium seats cost Rs. 1500 for adults and Rs. 1300 for seniors.
- Additionally, if the total cost of tickets exceeds Rs. 3500, then give a discount of 10%.

Write a 'C' program for customers to purchase the ticket and calculate the total cost of the tickets, taking into account the seat type, age, and quantity of tickets.

Hint: the seat type (R for regular, V for VIP, P for premium)

SOLUTION

```
#include <stdio.h>

main()
{
    char sT;
    int age, nT;
    double tP, tC;

    printf("Enter the seat type (R for regular, V for VIP, P for premium): ");
    scanf("%c", &sT);

    printf("Enter your age: ");
    scanf("%d", &age);

    printf("Enter the number of tickets: ");
    scanf("%d", &nT);

    if (sT == 'R') {
        if (age >= 18 && age <= 64)
            tP = 800.0;
        else
            tP = 700.0;
    } else if (sT == 'V') {
        if (age >= 18 && age <= 64)
            tP = 1000.0;
        else
            tP = 900.0;
    } else if (sT == 'P') {
        if (age >= 18 && age <= 64)
            tP = 1500.0;
        else
            tP = 1300.0;
        }

    // Total Cost
    tC = tP * nT;

    if(tC>3500)
    {
       tC = tC - tC*0.1;
       }

    printf("Total cost of tickets: Rs %.2lf\n", tC);

}
```

Question#3: **[32 points, CLO1, 25 mins]**

Write a 'C' program that helps an individual manage their finances. The program should provide a menu with the following options:

1. Calculate Yearly Salary and Assign a salary class.
2. Calculate Monthly Expenses and assign a household class.
3. Calculate Monthly Deficit or Surplus.
4. Exit

- **Calculate Yearly Salary**: Prompt the user to enter their weekly salary and calculate their yearly salary. Display the result. Assign a salary class, out of three possible classes of High income greater than 900,000, middle income greater than 600,000 and low income less than 300,000.
- **Calculate Monthly Expenses**: Prompt the user to enter their weekly expenses. Users will enter the weekly expenses in four categories of Food items, Bills, Education and Health. Calculate and print total weekly expenses, monthly expenses, and yearly expenses. There are four household classes of Elite (greater than 1,000,000), High (greater than 600,000), medium (greater than 300,000), low (less than 300,000).
- **Calculate Monthly Deficit and Surplus**: Prompt the user to enter their weekly income and total monthly expenses. Calculate whether there's a deficit **(expenses > income)** or surplus **(income > expenses)** for the month. At the end, display the monthly income, monthly expenses, and remaining amount and a message for deficit or surplus.

RUBERICS:

8 Marks for Main logic, switch, etc
8 Marks for Yearly Salary, conditions and classes
8 Marks for Monthly Expenses , conditions and classes
8 Marks for Deficit/ Surplus , conditions

SOLUTION:

```
#include <stdio.h>

int main() {
    int choice;
    double weeklySalary, yearlySalary;
    double weeklyExpenses, monthlyExpenses, yearlyExpenses;
    double weeklyIncome, monthlyIncome, remainingAmount;

    printf("1. Calculate Yearly Salary and Assign a Salary Class\n");
    printf("2. Calculate Monthly Expenses and Assign a Household Class\n");
    printf("3. Calculate Monthly Deficit or Surplus\n");
    printf("4. Exit\n");
    printf("Enter your choice: ");
    scanf("%d", &choice);

    switch (choice) {
        case 1:
            printf("Enter your weekly salary: ");
            scanf("%lf", &weeklySalary);
            yearlySalary = weeklySalary * 52;  // Assuming 52 weeks in a year
            printf("Your yearly salary is: PKR%.2lf\n", yearlySalary);
```

```
        // Assign a salary class (three possible classes)
        if (yearlySalary > 900000) {
            printf("Your salary class is High Income\n");
        } else if (yearlySalary > 600000) {
            printf("Your salary class is Middle Income\n");
        } else if (yearlySalary < 300000) {
            printf("Your salary class is Low Income\n");
        }
        break;

    case 2:
        weeklyExpenses = 0;
        printf("Enter your weekly expenses in the following categories:\n");
        printf("Food items: PKR");
        scanf("%lf", &weeklyExpenses);
        printf("Bills: PKR");
        scanf("%lf", &weeklyExpenses);
        printf("Education: PKR");
        scanf("%lf", &weeklyExpenses);
        printf("Health: PKR");
        scanf("%lf", &weeklyExpenses);

        // Calculate monthly and yearly expenses
        monthlyExpenses = weeklyExpenses * 4; // Assuming 4 weeks in a month
        yearlyExpenses = monthlyExpenses * 12;

        printf("Total weekly expenses: PKR%.2lf\n", weeklyExpenses);
        printf("Total monthly expenses: PKR%.2lf\n", monthlyExpenses);
        printf("Total yearly expenses: PKR%.2lf\n", yearlyExpenses);

        // Assign a household class (four possible classes)
        if (yearlyExpenses > 1000000) {
            printf("Your household class is Elite\n");
        } else if (yearlyExpenses > 600000) {
            printf("Your household class is High\n");
        } else if (yearlyExpenses > 300000) {
            printf("Your household class is Medium\n");
        } else {
            printf("Your household class is Low\n");
        }
        break;

    case 3:
        printf("Enter your weekly income: PKR");
        scanf("%lf", &weeklyIncome);
        printf("Enter your total monthly expenses: PKR");
        scanf("%lf", &monthlyExpenses);
```

```
        monthlyIncome = weeklyIncome * 4; // Assuming 4 weeks in a month
        remainingAmount = monthlyIncome - monthlyExpenses;

        printf("Monthly Income: PKR%.2lf\n", monthlyIncome);
        printf("Monthly Expenses: PKR%.2lf\n", monthlyExpenses);
        printf("Remaining Amount: PKR%.2lf\n", remainingAmount);

        if (remainingAmount >= 0) {
            printf("You have a surplus for the month.\n");
        } else {
            printf("You have a deficit for the month.\n");
        }
        break;

    case 4:
        printf("Program terminated. Goodbye!\n");
        break;

    default:
        printf("Invalid choice. Please enter a valid option.\n");
}

return 0;
```

BEST OF LUCK!