Assignment_01
Data Science & AI

Deadline: 16 September 2023, 5:00 PM Total Marks: 120
Submission Instructions

- This is an individual assignment.
- You are required to submit a pdf file with the naming convention **i23-xxxx_Section.** Failure to submit according to the above format would result in a deduction of 10% marks. Submissions other than Google classroom (e.g.email etc.) will not be accepted.
- You are required to write your solution in a pdf document & flowcharts must be designed in a proper diagram tool (for example: draw.io). Please note that handwritten assignment is unacceptable.
- All the questions must be done in sequence.
- Late submissions are not acceptable in any case
- Plagiarism(in any case) will lead to Zero marks in all assignments.

Question No. 1
Assume that the input from the user is valid, there is no need for input validation.

Write the pseudocode and flowchart of the following scenario.
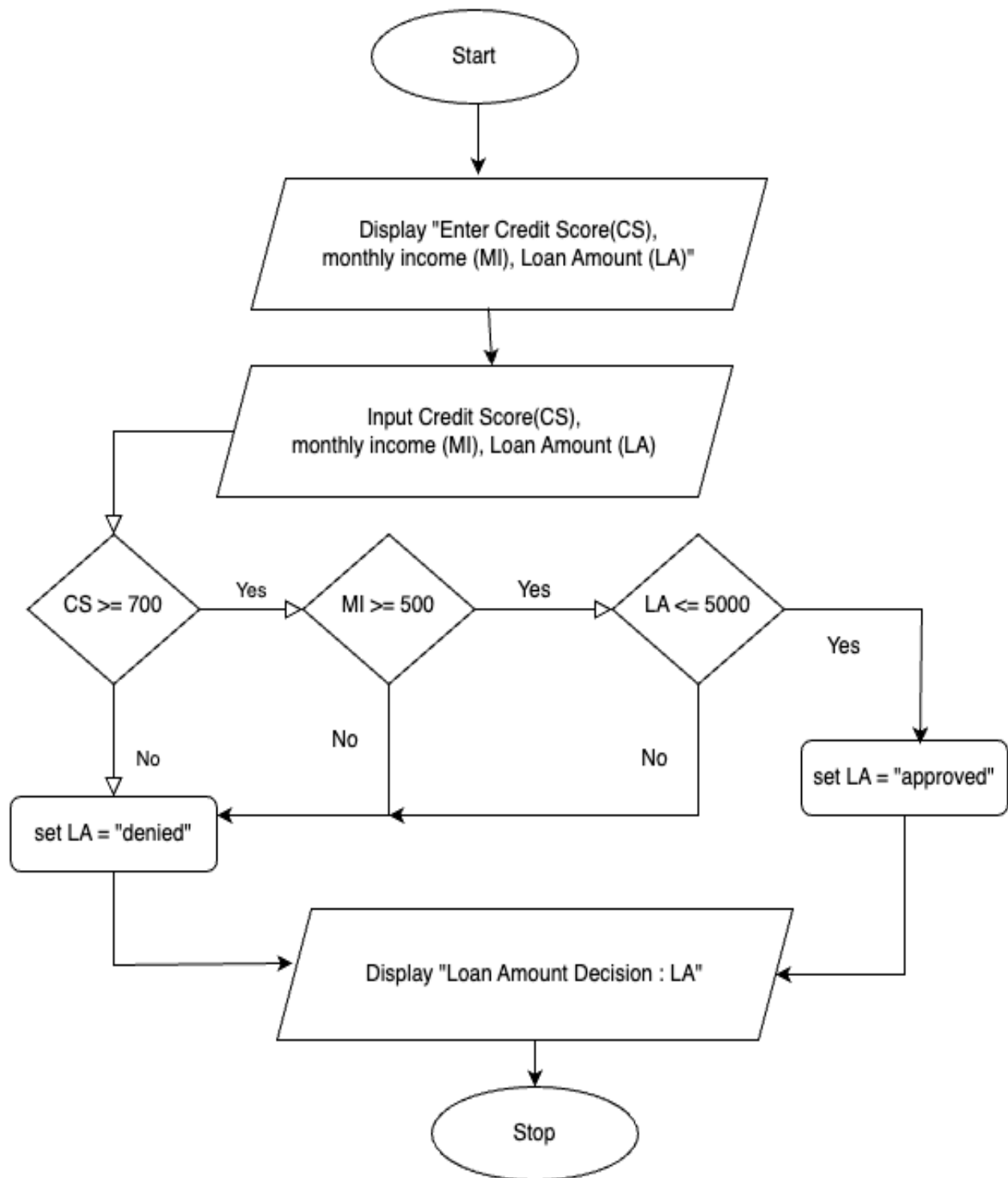**Scenario:** *Online Shopping Checkout Process*
Assume that there is a variable named **isNewUser.**The value of this variable can be either true or false.

1. **Start**

2. **Login/Register**: If the user is a new user, then the user has to register first. If not, he/she has to log In with credentials. After login or registration, the user will move to the next step.
   a. For registration, ask the user to enter his/her name, username, mobile number, email address and set his/her password.
   b. For Login, ask the user to enter his/her username and password.

3. **Cart Review**: The user is directed to a cart review page that displays the item information they have added to their cart. (Assume that the variables **productId, productName & productPrice** contain the product information.)
   .

4. **Address Selection:** The user is asked to provide a shipping address

5. **Shipping Method Selection**: The user enters a shipping method (standard or express delivery). Assume that input is valid, there is no need for input validation.

6. **Payment Method:** The user selects a payment method (credit card or cash).
Here, value of the variable **selectedPaymentMethod** will be set either "cash" or "credit card"
   a. Incase of credit card, input **credit Card Number, expiration date & CVC**(security code)

6. **Order Confirmation:** Now, ask the user "Are you sure to place the order?".
Here, value of the variable **orderConfirmed** will be set either "yes" or "no"

   a. Incase of orderConfirmed, display **"your order has been placed"**

7. **Stop**

Question 2

Scenario: Loan Approval Decision Process
Write a pseudocode of the following flow chart.

```
                            Start
                              |
                              v
              Display "Enter Credit Score(CS),
              monthly income (MI), Loan Amount (LA)"
                              |
                              v
               Input Credit Score(CS),
               monthly income (MI), Loan Amount (LA)
                              |
                              v
      CS >= 700  --Yes-->  MI >= 500  --Yes-->  LA <= 5000  --Yes-->  set LA = "approved"
          |                    |                     |                        |
          No                   No                    No                       |
          v                    |                     |                        |
      set LA = "denied"  <------+---------------------+                       |
          |                                                                   |
          v                                                                   v
              Display "Loan Amount Decision : LA"  <-------------------------+
                              |
                              v
                            Stop
```

Question No. 3

Assume that the input from the user is valid, there is no need for input validation.

Write the pseudocode and flowchart of the following scenario.
Scenario: **Vending Machine Purchase**

You are tasked with designing a program pseudocode and flowchart that simulates a vending machine for a snack shop. The vending machine has various snacks and accepts PKR as payment. It should provide the user with their selected snack and return any change if needed.

Requirements:

1. The vending machine should display a menu of available snacks, each with an associated price.

2. The user can select the available item(snack).
    Here, value of the variable **selectedSnack** will be set as "lays", "juice" or "drink"

3. The user should be able to insert currency notes into the machine (Rs. 20, Rs. 50, Rs.100 or Rs. 500) to pay for the selected snack.

4. The program should calculate the total amount inserted by the user and compare it to the snack's price.

5. If the user has inserted enough money, the vending machine dispenses the snack and returns any change.

6. If the user hasn't inserted enough money, the program should display a message indicating the remaining amount needed.

Suppose the vending machine offers the following items:

Lays: Rs. 30
Juice: Rs. 20
Drink: Rs. 100

Question No. 4

Write pseudocode and flowchart for a program that helps a library determine late fees for overdue books. The library charges fees based on the following rules:
1. If a book is 1-7 days overdue, the fee is $0.25 per day.
2. If a book is 8-14 days overdue, the fee is $0.50 per day.
3. If a book is 15-30 days overdue, the fee is $1.00 per day.
4. If a book is more than 30 days overdue, the fee is $2.00 per day.

Example:
If the book is 9 days overdue, **late fee = (7*0.25) + (2*0.5)**
If the book is 18 days overdue, **late fee = (7*0.25) + (7*0.5) + (4*1)**

These are just the examples, your program should be generic and give valid output on any input.

Your program should:

Prompt the user to input the number of days a book is overdue.
Calculate the late fee based on the rules.
Display the late fee to the user.

Question 5

Write pseudocode and flowchart for a program that helps a small coffee shop determine the price of a customer's order. The coffee shop offers various types of coffee (Regular, Latte, Cappuccino) and allows customers to customize their order with different sizes (Small, Medium, Large) and add-ons (Milk, Sugar, Whipped Cream). Each item has a base price, and add-ons have additional costs.

Here's the pricing information:

Regular Coffee:
Small: $2.00
Medium: $2.50
Large: $3.00

Latte:
Small: $3.50

Medium: $4.00
Large: $4.50

Cappuccino:
Small: $4.00
Medium: $4.50
Large: $5.00

Add-ons:
Milk: $0.50
Sugar: $0.25
Whipped Cream: $0.75

Your pseudocode should:

1. Ask the customer to choose a type of coffee (Regular, Latte, Cappuccino).
2. Ask the customer to choose a size (Small, Medium, Large).
3. Ask the customer if they want any add-ons (Milk, Sugar, Whipped Cream).
4. Calculate the total price of the order based on the customer's choices.
5. Display the total price to the customer.

Please provide the pseudocode and flowchart for this program.

Question 6
Assume that the input from the user is valid, there is no need for input validation.

The "Man of the Match" in cricket is typically decided based on outstanding performance during a match, including batting, bowling, fielding, and other contributions that significantly impact the game. Following is a simplified pseudocode to determine the "Man of the Match" in a cricket match.

Please note that the actual method for deciding the "Man of the Match" in professional cricket matches involves more complex criteria, including consultation with match officials, team captains, and often a panel of experts. This pseudocode simplifies the process for illustrative purposes. In reality, various factors are considered, and the decision may not solely rely on numerical scores.

Pseudocode

1. Start

2. Initialize variables for BattingScore, BowlingWickets, FieldingCatches, RunsScored, and WicketsTaken.

3. Prompt the user to enter the BattingScore, BowlingWickets, FieldingCatches, RunsScored, and WicketsTaken for each player.

4. Calculate a total performance score for each player using a predefined formula.
   PlayerScore = (BattingScore * 2) + (BowlingWickets * 10) + (FieldingCatches * 5) + (RunsScored * 1) + (WicketsTaken * 10)

5. Compare the PlayerScores of all players to find the highest score.

6. Identify the player with the highest score as the "Man of the Match."

7. Display the name of the "Man of the Match" along with their total performance score.

8. End

You have to design a flow chart according to the given pseudocode.
Please note that there are only two players, shaheen shah Afridi and Naseem Shah.

Question 7
a)

Assume that the input from the user is valid, there is no need for input validation.
Write a pseudocode and flowchart for the following arithmetic expression by taking all variables as input.

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

You are required to display both (two) values of x.

b)

You are tasked with designing a pseudocode and flowchart for a program that calculates the Body Mass Index (BMI) for an individual. BMI is a measure of a person's body weight in relation to their height and is often used to assess whether a person is underweight, normal weight, overweight, or obese.

Requirements:
The program should take input from the user for their weight and height.
Calculate the BMI using the formula: BMI = weight (kg) / (height (m) * height (m))

Categorize the BMI value based on the following ranges:

BMI less than 18.5: Underweight
BMI 18.5 to 24.9: Normal weight
BMI 25 to 29.9: Overweight
BMI 30 or greater: Obese

Display the calculated BMI value and the corresponding category (underweight, normal weight, overweight, or obese).

Question 8 (Stock Transaction Program)

Last month Hassan purchased some stock in Acme Software, Inc. Here are the details of the purchase:
- The number of shares that Hassan purchased was 900.
- When Hassan purchased the stock, he paid $49.50 per share.
- Hassan paid his stockbroker a commission that amounted to 3% of the amount he paid for the stock.

Two weeks later Hassan sold the stock. Here are the details of the sale:
- The number of shares that Hassan sold was 1,000.
- He sold the stock for $56.90 per share.
- He paid his stockbroker another commission that amounted to 1% of the amount he received for the stock.

Write a pseudocode and flowchart for a program that displays the following information:
- The amount of money Hassan paid for the stock.
- The amount of commission Hassan paid his broker when he bought the stock.

- The amount that Hassan sold the stock for.
- The amount of commission Hassan paid his broker when he sold the stock.
- Display the amount of profit that Hassan made after selling his stock and paying the two commissions to his broker. (If the amount of profit that your program displays is a negative number, then Hassan lost money on the transaction.)

Problem 9: (Ingredient Adjuster)

A cookie recipe calls for the following ingredients:
- 2 cups of sugar
- 1 cup of butter
- 2.15 cups of flour

The recipe produces 48 cookies with this amount of the ingredients. Write a pseudocode and flowchart for a program that asks the user how many cookies he or she wants to make, and then displays the number of cups of each ingredient needed for the specified number of cookies.

Question 10

Write a pseudocode & flowchart for a program that directs a cashier how to give change. The program has two inputs: the amount due and the amount received from the customer. Display the dollars, quarters, dimes, nickels, and pennies that the customer should receive in return.

- A dollar is worth 100 cents
- A quarter is worth 25 cents
- A dime is worth 10 cents
- A nickel is worth 5 cents
- A penny is worth 1 cent

Question 11

Execute the following flowchart for the following inputs. Please note all the variables are integers. You are required to show each step of your working.

1. 10
2. 60
3. 65

```
                              ┌─────────┐
                              │  Start  │
                              └────┬────┘
                                   │
                                   ▼
              ┌─────────────────────────────────────────┐
              │      Set dN=0,  bR=" " , oR= " "         │
              └─────────────────────┬───────────────────┘
                                    │
                                    ▼
              ╱─────────────────────────────────────────╱
              │        Display "Enter a number"          │
              │              Input dN                    │
              ╱─────────────────────────────────────────╱
                                    │
                                    ▼
                        ┌───────────────────┐
                        │   Set temp=dN     │
                        └─────────┬─────────┘
                                  │
            ┌─────────────────────┘
            │
            ▼
       ◇─────────────◇   Yes    ┌─────────────────────────────────────┐
       │  temp > 0   ├─────────▶│   Set remainder = temp % 2          │
       ◇─────────────◇          │   Set character = char ( remainder )│
            │                   │   Set temp = temp / 2               │
            │ No                │   bR.append (character)             │
            ▼                   └─────────────────────────────────────┘
   ┌───────────────────┐
   │   Set temp=dN     │
   └─────────┬─────────┘
             │
             ▼
       ◇─────────────◇   Yes    ┌─────────────────────────────────────┐
       │   temp>0    ├─────────▶│   Set remainder = temp % 8          │
       ◇─────────────◇          │   Set character = char ( remainder )│
             │                  │   Set temp = temp / 8               │
             │ No               │   oR.append (character)             │
             ▼                  └─────────────────────────────────────┘
   ┌───────────────────┐        ╱──────────────────────────╱
   │  bR = reverse ( bR )│─────▶│      Display bR           │
   │  oR=reverse ( oR )  │      │      Display oR           │
   └───────────────────┘        ╱──────────────────────────╱
                                            │
                                            ▼
                                      ┌─────────┐
                                      │  Stop   │
                                      └─────────┘
```