**Programming Fundamentals (CS 1002)**

**FALL 2021 ASSIGNMENT # 1**

**Due Date: Monday, October 11, 2021 (10:00 am)**

**Instructions**

Submission: Assignment is divided into two parts. Part I consists of pseudocode and flowchart questions; it has to be hand-written. Part II consists of C++ programming questions. Please follow the following submission instructions. Failure to submit according to the above format would result in deduction of 10% marks. Submissions on the email will not be accepted.

* **Part I**: Submit this part to your respective instructor, if you do not have PF class on due date, you can drop it in his/her office. Make sure that you have clearly mentioned your Name, Registration Number and Section on the front page.
* **Part II:** Combine all your work (solution folder) in one .zip file. Use proper naming convention for your submission file. Name the .zip file as **SECTION\_ROLL-NUM\_04.zip** (**e.g.** **A\_21i0412\_04.zip**). Your zip file should only contain **.cpp** files, each file should correspond to its question/problem number. Submit .zip file on Google Classroom within the deadline.

**Plagiarism:** Plagiarism cases will be strictly dealt with. If found plagiarized, both the involved parties will be awarded zero marks in this assignment, all of the remaining assignments, or even an **F grade** in the course. Copying from the internet is the easiest way to get caught!

**Deadline:** The deadline to submit the assignment is **Monday, October 11, 2021 (10:00 am)**. Late submission with marks deduction will be accepted. Correct and timely submission of the assignment is the rresponsibility of every student; hence no relaxation will be given to anyone.

**Marking criteria:** Your submitted programs will be marked on the following criteria.

|  |  |
| --- | --- |
| Functional requirements | 50% |
| Good user interface (user friendly instructions, layout, presentation) | 20% |
| Proper source code indentation | 10% |
| Programming conventions followed (e.g. variable names, ) | 20% |

**Note:** Start early so that you can finish it on time

PART I – Make flowchart for the following problems.

**Problem 1:**

One of the major problems at the post office is when Postal codes are typed incorrectly. This can result in letters being sent to the wrong address and then having to be picked up again to be sent to the correct address. Advances in artificial intelligence are starting to provide new solutions to this problem. Artificial intelligence has reached the point where many addresses can be read by artificial Intelligence and the Postal code for that address determined. If the Postal code determined by artificial Intelligence matches the Postal code which is typed in the letter, the letter is sorted normally to go to the indicated destination. It, however, the address and Postal code do not match, the software will attempt to rectify this situation by making several transformations on the Postal code based upon common mistakes. One of the common mistakes is the transposition of letters where something like M2K will be typed as K2M. Another common mistake is to hit a letter adjacent to the one you want on the keyboard. Therefore, the second transformation that will be attempted will be to substitute all the letters directly adjacent to the letter typed on the keyboard to see if this will match the Postal code guessed by the artificial Intelligence. If one of these transformations does result in the postcodes matching, then the letter will be sorted and sent to the destination indicated by the Postal code. In cases where the address cannot be read and guessed by the artificial intelligence or where transformations on the Postal code cannot be made to match the Postal code from the artificial Intelligence or in the case where no Postal code was entered, the letters are sorted into a bin that will require a human to look at them. It has been determined that human can look at about 250 letters at once before they need a break. Therefore, the bins can hold approximately 300 letters and every time 300 letters are placed in one of these bins that bin is moved forward on a conveyor belt and replaced by a new, empty bin.

Your job is to produce a detailed flow chart that will show how this process can be carried out. You can assume that you've got a black box process to help you that you should use:

|  |  |
| --- | --- |
| guessPostalCode | which can be called by your flow chart whenever it wants the artificial Intelligence to guess the post code based on the address. This black box will return either an empty string indicating that it cannot guess the Postal code or a valid Postal code. |
| getNearbyLetters | to create a list of adjacent letters on a standard keyboard given any single letter. |
| sortToDestination | which will have the sorting machine move the letter to the bin for the destination indicated by the postal code you provide. |
| manualSort | which will have the sorting machine move the letter to a bin that will be examined by a human. |
| newManualBin | which will move the bin for letters requiring human intervention forward and replace it with an empty bin. |
| nextLetter | which will move the next letter under the scanner and return 1 or it will return O if there are no more letters to sort or if the system is being manually shut down. When a 0 is received, this should shut down the system. |

Your flow chart should show sufficient detail that it could be used to write computer code to solve the problem without the programmer needing to know any additional information.

PART II – Make C++ Programs for the following tasks

**Problem 2:** We need computer to make a credit card wallet application with the following functionality. The bank staff sets the maximum credit limit for the customer. At the end of the month, the banking staff enters the amount of credit used by the customer. The application then calculates the remaining credit and displays it on the screen.

**Problem 3: (Sales Prediction)** The East Coast sales division of a company generates 58 percent of total sales. Based on that percentage, write a program that will predict how much the East Coast division will generate if the company has $8.6 million in sales this year.

**Problem 4: (Restaurant Bill)** Write a program that computes the tax and tip on a restaurant bill for a patron with a $88.67 meal charge. The tax should be 6.75 percent of the meal cost. The tip should  
be 20 percent of the total after adding the tax. Display the meal cost, tax amount, tip amount, and total bill on the screen.

**Problem 5:**

**(Average of Values)** To get the average of a series of values, you add the values up and then divide the sum by the number of values. Write a program that stores the following values in five different variables: 28, 32, 37, 24, and 33. The program should first calculate the sum of these five variables and store the result in a separate variable named sum. Then, the program should divide the sum variable by 5 to get the average. Display the average on the screen.

**Problem 6: (Total Purchase)** A customer in a store is purchasing five items. The prices of the five items are:

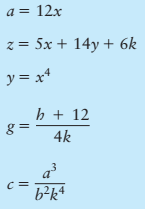
|  |
| --- |
| Price of item 1 = $15.95 Price of item 2 = $24.95 Price of item 3 = $6.95 Price of item 4 = $12.95 Price of item 5 = $3.95 |

Write a program that holds the prices of the five items in five variables. Display each item’s price, the subtotal of the sale, the amount of sales tax, and the total. Assume the sales tax is 7%.

**Problem 7: (Ocean Levels)** Assuming the ocean’s level is currently rising at about 1.5 millimetres per year, write a program that displays:

* The number of millimeters higher than the current level that the ocean’s level will be in 5 years
* The number of millimeters higher than the current level that the ocean’s level will be in 7 years
* The number of millimeters higher than the current level that the ocean’s level will be in 10 years

**Problem 8: (Cyborg Data Type Sizes)** You have been given a job as a programmer on a Cyborg supercomputer. In order to accomplish some calculations, you need to know how many bytes the following data types use: char, int, float, and double. You do not have any manuals, so you can’t  
look this information up. Write a C++ program that will determine the amount of memory used by these types and display the information on the screen.

**Problem 9:** Write a C++ program to implement the following algebraic expressions to calculate and display the values of **a,z,y,g,c**. Other variables in the program will be input by the user:  


**Problem 10: (Stadium Seating)** There are three seating categories at a stadium. For a softball game, Class A seats cost $15, Class B seats cost $12, and Class C seats cost $9. Write a program that asks how  
many tickets for each class of seats were sold, then displays the amount of income generated from ticket sales. Format your dollar amount in fixed-point notation, with two  
decimal places of precision, and be sure the decimal point is always displayed.

**Problem 11: (Ingredient Adjuster)** A cookie recipe calls for the following ingredients:

* 1.5 cups of sugar
* 1 cup of butter
* 2.75 cups of flour

The recipe produces 48 cookies with this amount of the ingredients. Write 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.

**Problem 12: (Currency)** Write a program that will ask user to enter amount in US dollars and then convert U.S. dollar amounts to Pakistani rupee and to euros, storing the conversion factors in the constants RUPEE\_PER\_DOLLAR and EUROS\_PER\_DOLLAR. To get the most up-to-date exchange rates, search the Internet using the term “currency exchange rate”. If you cannot find the most recent exchange rates, use the following:

1 Dollar = 170.75 Rupees  
1 Dollar = 0.86 Euros

Format your currency amounts in fixed-point notation, with two decimal places of precision, and be sure the decimal point is always displayed.

**Problem 13: (Stock Transaction Program)** Last month Joe purchased some stock in Acme Software, Inc. Here are the details of the purchase:

* The number of shares that Joe purchased was 1,000.
* When Joe purchased the stock, he paid $45.50 per share.
* Joe paid his stockbroker a commission that amounted to 2% of the amount he paid  
  for the stock.

Two weeks later Joe sold the stock. Here are the details of the sale:

* The number of shares that Joe sold was 1,000.
* He sold the stock for $56.90 per share.
* He paid his stockbroker another commission that amounted to 2% of the amount he received for the stock.

Write a program that displays the following information:

* The amount of money Joe paid for the stock.
* The amount of commission Joe paid his broker when he bought the stock.
* The amount that Joe sold the stock for.
* The amount of commission Joe paid his broker when he sold the stock.
* Display the amount of profit that Joe 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 Joe lost money on the transaction.)