Programming Fundamentals (CS1002)| FALL2022

Due Date: 23rd October, 2022 on GCR

Assignment 3 – Decision Structures, Functions

[100 marks]

Instructions

Submission: For **each question**, make a **separate file**. i.e., Q1.cpp, Q2.cpp, …., Q9.cpp. For different parts use Q9a.cpp, etc as naming convention. Combine all files in one .zip file. Use proper naming convention for your submission file. Name the .zip file as SECTION_REG# _03.zip (For example, A_22i0412_03.zip). Submit .zip file on Google Classroom within the deadline. **Failure to submit according to the above format would result in deduction of 10% marks.**

Plagiarism: Plagiarism cases will be dealt strictly. 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! Try to learn by doing assignments yourself.

Deadline: The deadline to submit the assignment is **23rd October 2022 at 11:59 PM.** Late submission with marks deduction will be accepted according to the following criteria

Time	Deduction
Submission within next 24 hours	50%
Submission after 24hrs but within 48 hours	75%
Submissions received after 48 hours	100%

Correct and timely submission of the assignment is the responsibility of every student; hence no relaxation will be given to anyone.

Bonus: There are 3 bonus marks if you submit it 24 hours early and 5 marks if you submit it 48 hours early. Bonus is applicable only if you have attempted all questions.

Error Handling: You are required to do error handling for incorrect input. Display a relevant message in case of incorrect input. Write error(string err) for each question. You are allowed to write overloaded error functions (if required).

Input validation: Make an overloaded function validate for input validation for each question.

Functions: Split each problem in sub-problems. For every subproblem create a separate function. For some questions optional functions as a hint are already given.

Comments and indentation: Comment and indent your code properly. Write your name and roll number (as a block comment) at the beginning of the solution to each problem (each file).

Note: *Follow the given instructions to the letter, failing to do so will result in a zero*

YOU ARE REQUIRED TO WRITE C++ PROGRAM FOR EACH OF THE FOLLOWING QUESTIONS

Tasks

1. Overlapping Appointments (if compound statements &&/||)

In a scheduling program, we want to check whether two appointments overlap. For simplicity, appointments start at a full hour, and we use time in hours (0–23). Write a program that takes date, start time, and end time of both appointments and checks whether these appointments overlap.
Functions: *gettime, getdate, validate* and *isoverlapping*.
Input validation: (date, time)

2. Control Software for your vehicle (Switch)
A minivan has two sliding doors. Each door can be opened by either a dashboard switch, its inside handle, or its outside handle. However, the inside handles do not work if a child lock switch is activated. In order for the sliding doors to open, the gear shift must be in park, *and* the master unlock switch must be activated. Your task is to simulate a portion of the control software for the vehicle. The input is a sequence of values for the switches and the gear shift, in the following order:

- Dashboard switches for left and right sliding door, child lock, and master unlock (0 for off or 1 for activated)
- Inside and outside handles on the left and right sliding doors (0 or 1)
- The gear shift setting (one of P N D 1 2 3 R).

A typical input would be 0 0 0 1 0 1 0 0 P. Print "left door opens" and/or "right door opens" as appropriate. If neither door opens, print "both doors stay closed".

Input validation: (For each input)
Functions: getswitchstatus, gethandle, getgearshift, validate

3. Unit conversion (if-else)
Write a unit conversion program that asks the users from which unit they want to convert (fl. oz, gal, oz, lb, in, ft, mi) and to which unit they want to convert (ml, l, g, kg, mm, cm, m, km). Reject incompatible conversions (such as gal to km). Ask for the value to be converted, then display the result as follows

Convert from? gal
Convert to? ml
Value? 2.5
2.5gal = 9462.5ml
Input validation: from unit, to unit , value

4. Romans Numerals (if-else)

Write a program that converts a positive integer into the Roman number system. The Roman number corresponding to decimal system are shown in the table on the right. Numbers are formed according to the following rules.

Roman letter	Decimal system
I	1
V	5
X	10
L	50
C	100
D	500
M	1000

- Only numbers up to 3,999 are represented.
- As in the decimal system, the thousands, hundreds, tens, and ones are expressed separately.
- The numbers 1 to 9 are expressed as 1 (I), 2(II), 3(III), 4(IV), 5(V), 6(VI), 7(VII), 8(VIII) and 9(IX). As you can see, an I preceding a V or X is subtracted from the value, and you can never have more than three I's in a row.
- Tens and hundreds are done the same way except that the letters X, L, C and C, D, M are used instead of I, V, X, respectively.

Your program should take an input, such as 1978, and convert it to Roman numerals, MCMLXXVIII

Input validation: Number range

5. Car Price Calculator (Ternary Operator + other constructs(optional))

Write a program that calculates the price of the car. Use the table given below to make your program. Your program should take total budget and tax filer status as inputs from the user. Your program should allow user to select among different features. At the end, your program should display all selected items, total budget, tax filer status and a message. Your price calculator should print, "Sorry! You don't afford it.", if it is out of the budget otherwise print "You have a good taste, go for it!" as a message.

NOTE: For non-filer you have to pay Rs. 75,000, otherwise Rs. 25,000

Car Type	Options	Cost (Rs.)
Manual	-	3, 769,000
Automatic	-	3, 899, 000
Optional Features		
Infotainment System	With navigation system	59,500
	Without navigation system	8,000
Fog Lights	Halogen	2,000
	LED	5,000
High grade Interior	Leather Seats	45,000
	Sofa Seats	25,000
Floor Mats		6,0000
Door visors		6,0000
Trunk Tray		8,500

6. Increasing or Decreasing (Ternary Operator + any other decision construct (optional))

Write a program that reads three numbers and displays "increasing" if they are in increasing order, "decreasing" if they are in decreasing order, and "neither" otherwise. Here, "increasing" means "strictly increasing", with each value larger than its predecessor. Before reading numbers, your program should ask the user whether increasing/decreasing should be "strict" or "lenient". In lenient mode, the sequence 3 4 4 is increasing and the sequence 4 4 4 is both increasing and decreasing.

7. Data Packages (Nested Switch)
PLink, a cellular company, provides the following three different post-paid data packages for its customers
Package A: For Rs. 100 per month, 2GB data is provided. Additional data can be purchased for Rs. 30 per 100MB
Package B: For Rs. 250 per month, 5.5GB data is provided. Additional data can be purchased for Rs. 20 per 100MB
Package C: For Rs. 1000 per month, unlimited access is provided

Task A: Write a program that calculates customer's monthly bill. It should ask how many GBs the customer has used in the month and which package the customer has subscribed for. It should then display the total amount due.

Task B: Modify the program in part A so that it also displays how much money package A customer would save if they purchase package B or C and how much money package B customer would save if they purchase package A or C and much money package C customer would save if they purchase package A or B.

8. [15 marks] Discounted Tickets (Nested if)

JoyLand decided to make the tickets more affordable and devised following rules
Rule 1: You get a discount of 50% if you are younger than 22
Rule 2: You get a discount of 20%, if you live in either city A or city B and work anywhere outside these cities.
Rule 3: You get a discount of 90%, if your income is below Rs. 10000 a month
A person that fits any one of the above eligibility criteria would get a discount. Write a program that help the customer to find out if they are eligible for discounted seasonal ticket or not.

Program Inputs: name (string), date of birth(int year, int month, int day), postal code(string), income (flaot)
Input validation: date of birth, postal code. Postal code of city A has a format 4#3# (e.g., 4532) and postal code of B has a format 5#?##, where ? means 5 or 3 (e.g., 53344 and 54533 both are valid)
Sample output: Replace name with name of customer
Congratulations {name}!
You are eligible for discount of 20%.

9. [15 marks] Network Interface (Nested if/if-else)

You are a networks engineer for a renowned product development company. You have been tasked with programming the interface for one of your company's applications. Before proceeding ahead, you are required to write the following functions for your development:

IsConnected()	Checks if the application is connected to the WiFi. Returns a boolean value. True if connected, false otherwise
availableBandwidth()	Returns a float value. This function returns the available bandwidth on the network
startApplication()	This runs the application. This function is to be run after you validate the conditions for your network (more on that below)
stopApplication()	This function stops a currently running application
error(string error)	This function is used whenever you encounter an invalid condition or an error
getFileType(char type)	This function gets the file type of the message that you received from the network. The file type are T="txt", M ="mp4" and P ="mp3", I= "invalid"
saveFile(string location, string filename)	This function saves the current file inside a location, which is specified by a string parameter. The second parameter is takes is the file itself, passed as a string
isFileSaved(string filename)	This function checks if the file passed as a parameter has been saved in the application's files or not
sendMessage(string message)	This function sends the message to the client. It takes a string parameter which is the message to be sent to the client

1. You are required to write a function networkStartValidator() which calls the function startApplication() if the following conditions are true:
   - The application is connected to the WiFi.
   - The available bandwidth is greater than 20

In case of any errors or conditions that don't follow the above conditions, networkStartValidator() is to call error() and pass an appropriate message as a string parameter

2. Now that you have implemented networkStartValidator(), and started your application, you have to implement the function fileSaver(string filename). This function should save the file (which is passed as a string parameter to the function) in a location as depending on the type of the message. The function follows the following guidelines:
   a. File saving will only be done if the available network bandwidth is greater than 5.
      i. If the file type is "txt", then save in the location "Text files"
      ii. If the file type is "mp3", then save in the location "Sound files"
      iii. If the file type is "mp4", then save in the location "Video files"
      iv. If the file type is "invalid", then report this as an error using the error() function

3. Finally, your application will send a message back to the client that sent the file earlier. You will implement the networkSend(string returnMessage, string filename) function. This uses the aforementioned helper functions to send the message to the client. It takes a string parameter returnMessage which is the message to be sent to the client, and the name of the file that was received earlier, filename. The message will only be sent if the following conditions are satisfied: The given file name has been saved in the applications files The applications is connected to the WiFi The available network bandwidth is greater than 10 If any of the above conditions fail, an error is to be reported using the error() function