



CL-2001 Data Structures Home Work-02

Objectives:

- Binary Tree
- BST/Heap
- Recursion

Deadline: 27-Nov-2022

Note: Carefully read the following instructions (*Each instruction contains a weightage*)

1. There must be a block of comments at start of every question's code by students; the block should contain brief description about functionality of code.
2. Comment on every function and about its functionality.
3. Mention comments where necessary such as comments with variables, loop, classes etc to increase code understandability.
4. Use understandable name of variables.
5. Proper indentation of code is essential.
6. Write a code in C# language.
7. First think about statement problems and then write/draw your logic on copy.
8. After copy pencil work, code the problem statement on MS Studio C# compiler.
9. At the end when you done your tasks, attached C# created files in MS word file and make your submission on Google Classroom. (Make sure your submission is completed).
10. Please submit your file in this format **19F1234_L4**.

Note Submission:

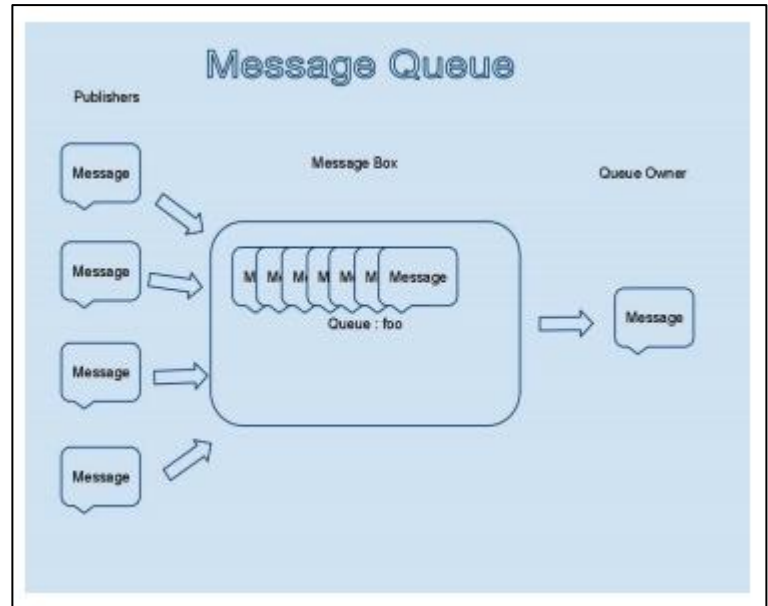
11. **Make a Microsoft Word file and paste all of your C++ code with all possible screenshots of outputs in Microsoft Word and submit word file.**
12. **Also submit all .ccp file.**
13. **Don't Zip the files**
14. **There will a viva of it after due date.**
15. **Do not submit your assignment after deadline. Late and email submission is not accepted.**
16. **Do not copy code from any source otherwise you will be penalized with **Zero (0)** marks.**

Problem: 1| Heap/Priority Queue [2 wtg 10 marks]

Messenger is used to send or receive text messages. When someone is offline a messenger maintains a buffer of messages which is delivered to the receiver when he gets online.

The phenomena take place on simple timestamp phenomena, the message delivered earlier will be sent to the receiver first and the message received late will be delivered after it. Sometime a message in the buffer may have higher priority so it should be delivered earlier on the higher priority. Some of the messages are to be delivered on a particular day or a date are also in the same buffer. Your task is to select a suitable data structure (**Heap or Priority Queue**) and implement the requirements mentioned above.

You need to implement program which shows a user to be offline, display the messages, with a click or a key stroke make the user online and deliver/display the messages according to the mentioned criteria.



Problem: 2| BST [2 wtg 15 marks]

Write an **Array** based implementation of BST.

1. Insertion()
 2. Deletion()
 3. Search()
 4. Inorder(), PreOrder(), PostOrder()
 5. Height()
 6. Write a Function to find the number of nodes at a specific height (given by user).
 7. Write a function to count the leaf nodes in a BST.
- **Note: Run all methods in main show the output.**



Problem: 3 | Recursion [3 wtg 15 marks]

There's a staircase with N steps, and you can climb 1 or 2 steps at a time. Given N , write a function that returns/print the number of unique ways you can climb the staircase. The order of the steps matters.

For example, if N is 4, then there are 5 unique ways:

- ✓ 1, 1, 1, 1
- ✓ 2, 1, 1
- ✓ 1, 2, 1
- ✓ 1, 1, 2
- ✓ 2, 2

What if, instead of being able to climb 1 or 2 steps at a time, you could climb any number from a set of positive integers X ? Generalize your function to take in N . Print the all unique ways.



Best of luck