Manipal Institute of Technology, Manipal
Department of Information and Communication Technology
Subject: Data Structures
Code: ICT 2121
Assignment type: FISAC
Mode of conduction: Take home assignment
Last date to submit: 06/11/2023

Instructions:

- Answers must be handwritten on A4 size paper
- Copying is strictly prohibited
- Failure to meet deadline causes one mark deduction per day
- Direct copying from internet causes that particular answer to be invalidated.

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1. Construct an equivalent binary tree for the tree given in Figure 1. Illustrate the steps of the construction.
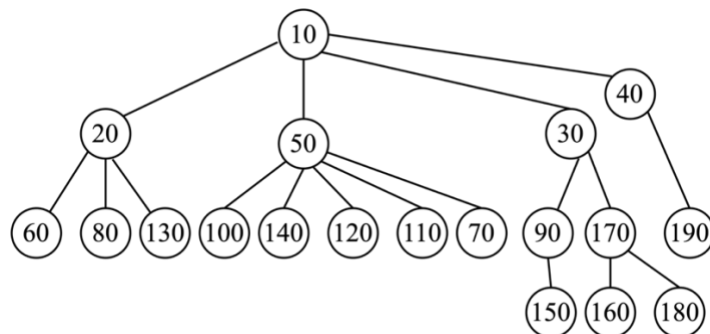

Figure 1

2. An application needs to parse the input string to validate HTML tags. Input will be of the form <T> TEXT </T>. This structure could occur repeatedly until # , which signifies the end of the content. Choose a suitable data structure for designing this application. Write and explain the suitable code snippet for counting all the missing or invalid tags.
   Hint: Sample Examples:
   a) input: <T> html tag </T> # output: count=0
   b) input: <T> html tag <T> #   output: count=2
   c)) input: <T> html tag </T> <T> dasda </T> # output: count=0
   d)) input: <T> html tag <T> <T> dasda # output: count=3

3. What is Huffman coding ? Explain the use of binary trees in Huffman coding with an example.

4. Write a user defined function to split the singly linked list into two lists according to the following example.
Input: 1→2→3→4→5→6
After splitting: list1 =1→3→5   List2 = 2→--4→6

5. Imagine you are attending a party where people are standing in a straight line, holding hands with the person next to them. Each person is labeled with a unique number on their t-shirt, starting from 1. The person at the front of the line is holding a sign that says "Head". Now, your task is to reverse the line by rearranging the people in such a way that the person who was at the front of the line with the sign "Head" is now at the end of the line, and the person who was at the end of the line is now at the front with the sign "Head". You are not allowed to break the hand-holding chain, and you should not change the order or position of the other people in the line. Apply the linked list data structure concept to achieve the outcome.

6. Imagine you are organizing a library with books arranged in a hierarchical manner shown in Fig2. Each book has a unique identification number, and they are placed on shelves based on their identification numbers. The shelves are organized in such a way that each shelf has a label indicating the range of identification numbers of the books it contains. The shelves are further divided into sections labeled as "left" or "right", separating books with smaller identification numbers from those with larger identification numbers.
Can you automate in printing the books in two different orders: preorder and level order?
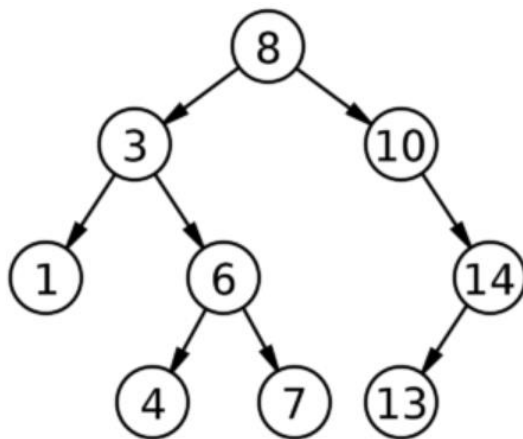
Fig2: BST

7. A book is divided into three chapters. Each chapter is divided into five sections and each section is divided into five subsections. Which data structure according to you is the most suitable way to represent the scenario of book mentioned above? Justify your answer.

8. Write a user defined function for deleting the node with smallest key element in a doubly linked list.

9. Write a user defined function to find the symmetric difference between two input SLLs without using any intermediate arrays. Note: *SymmetricDifference(A, B) is (A-B)U(B-A).*
10. Write a user defined functions to create a circular singly linked list to store an integer element and delete the nodes that contains the prime number from the CSLL.