DAA
Lab Report-3

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Aim: To create a binary tree,display its inorder traversal,find the lowest common ancestor and to create a heap sort algorithm and compute runtime and memory utilization using different length of arrays.

Theory:

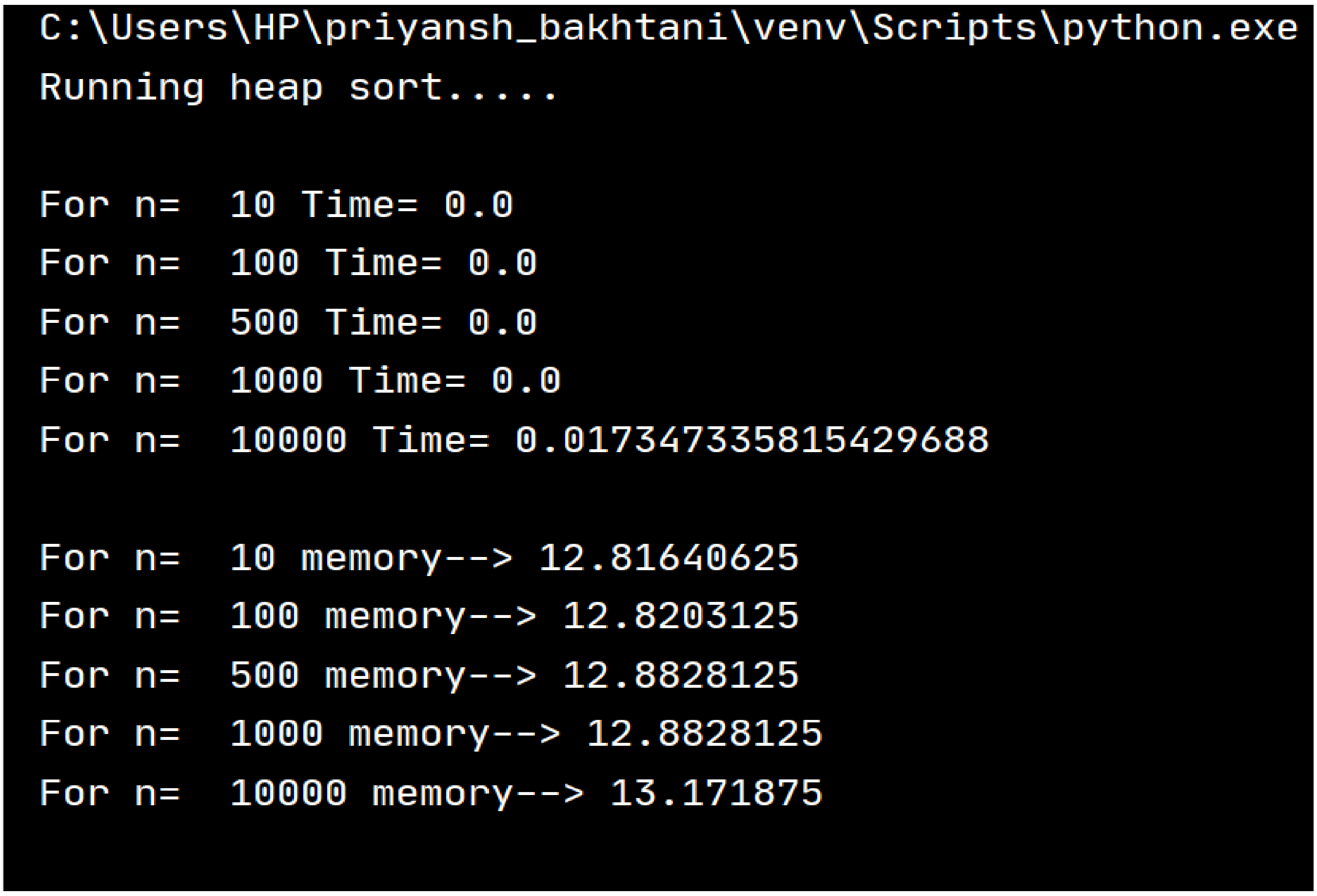
- **Heap Sort:** A sorting algorithm that works by organizing the data to be sorted into a special type of binary tree called a heap.The heap has the largest value at the top of the tree so the heap sort algorithm must also reverse the order.
- **Binary search tree:** It is a node- based binary tree data structure in which:
    - The left subtree of a node contains only nodes with lesser than the node's key.
    - The right subtree of a node contains only nodes with greater than the node's key.
    - The left and right subtree each must also be a binary tree.
- **Max. and min. depth:** The max. depth is the number of nodes along the longest path from the root to the nearest leaf node.

  The min. depth is the number of nodes along the shortest path from the root to the nearest leaf node.
- **Lowest common ancestor:** The LCA of two nodes v and w is the lowest node that has both v and w as descendents, where we define each node to be the descendent of itself.

- **Memory and runtime Table for heap sort (Observation):**

n	10	100	500	1000	10000
Runtime	0.0	0.0	0.0	0.0	0.0173473
Memory Utilization	12.81640625	12.8203125	12.8828125	12.8828125	13.171875

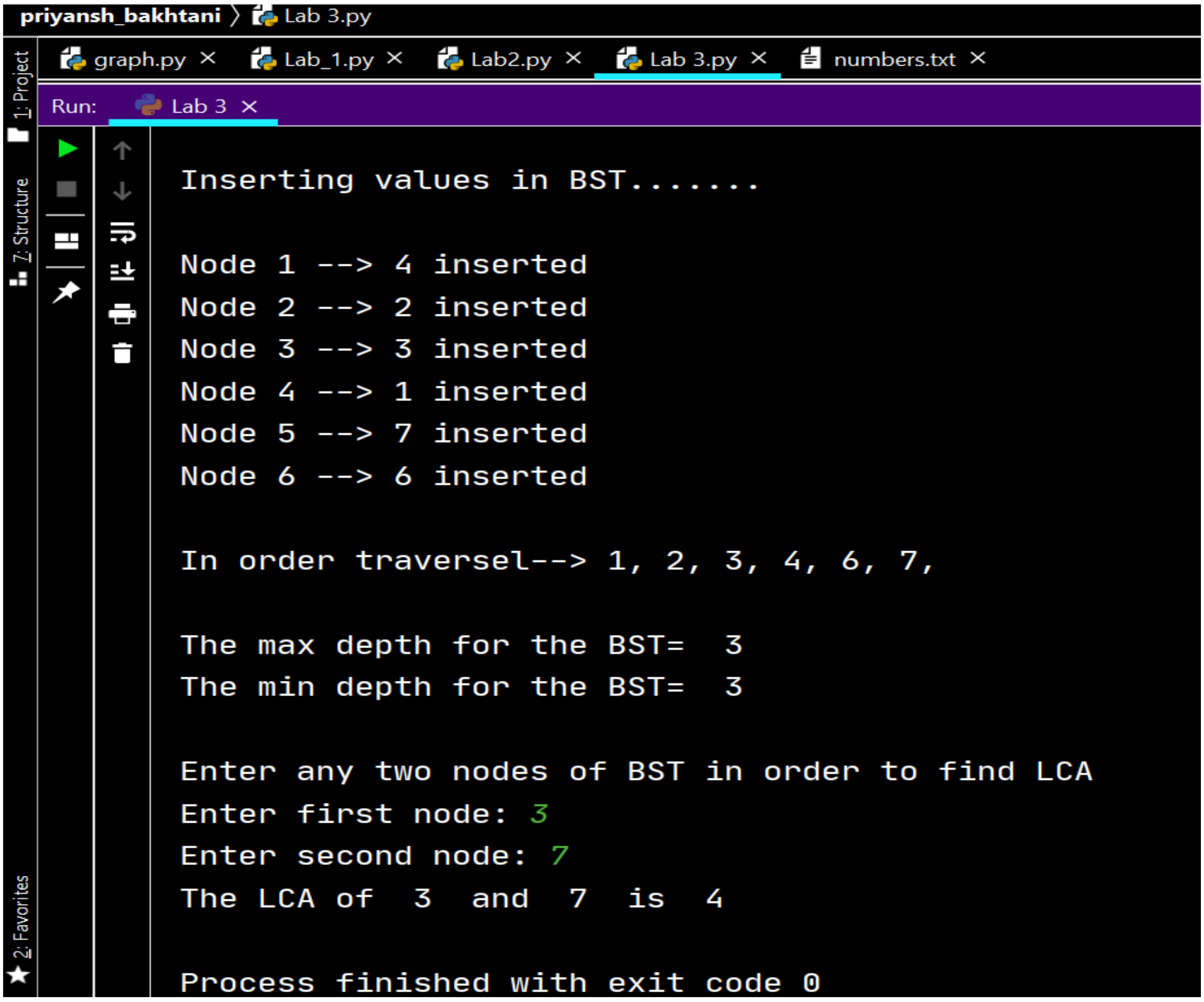
Outputs:



```
C:\Users\HP\priyansh_bakhtani\venv\Scripts\python.exe
Running heap sort.....

For n=  10 Time= 0.0
For n=  100 Time= 0.0
For n=  500 Time= 0.0
For n=  1000 Time= 0.0
For n=  10000 Time= 0.017347335815429688

For n=  10 memory--> 12.81640625
For n=  100 memory--> 12.8203125
For n=  500 memory--> 12.8828125
For n=  1000 memory--> 12.8828125
For n=  10000 memory--> 13.171875
```



```
Inserting values in BST.......

Node 1 --> 4 inserted
Node 2 --> 2 inserted
Node 3 --> 3 inserted
Node 4 --> 1 inserted
Node 5 --> 7 inserted
Node 6 --> 6 inserted

In order traversel--> 1, 2, 3, 4, 6, 7,

The max depth for the BST=  3
The min depth for the BST=  3

Enter any two nodes of BST in order to find LCA
Enter first node: 3
Enter second node: 7
The LCA of  3  and  7  is  4

Process finished with exit code 0
```