CS2302 - Data Structures

Spring 2020

Exercise - B-trees

1. The class BST included in the file *btree.py* implements basic b-tree operations. Looking at the code, answer the following questions:
   (a) What are the data attributes of an object of class BTree?
   (b) What are the data attributes of an object of class BTreeNode?
   (c) Let t be a reference to a BTreeNode. How can we determine the number of data items that are stored in the node?
   (d) Let t be a reference to a BTreeNode. How can we determine if the node is full?
   (e) Let t be a reference to a BTreeNode. Where is the smallest item in the node stored?
   (f) Let t be a reference to a BTreeNode. Where is the largest item in the node stored?
2. What is the output produced by the following program?

```
import matplotlib.pyplot as plt
import numpy as np
import btree

if __name__ == "__main__":
    plt.close('all')
    T = btree.BTree()

    nums = [6, 3, 23,16, 11, 25, 7, 17,27, 30, 21, 14, 26, 8, 29, 22, 28, 5,
    19, 24, 15, 1, 2, 4, 18, 13, 9, 20, 10, 12]

    for num in nums:
        T.insert(num)
    T.draw()

    print(T.max_items)
    print(T.root.data)
    print(len(T.root.child))
    print(T.root.is_leaf)
    print(len(T.root.child[0].data))
    print(sum(T.root.child[0].child[1].data))
    print(T.root.child[1].child[0].data[0])
    print(T.root.child[0].child[2].is_leaf)
    t = T.find(4)
    print(t.data)
```