Assignment-‘1’

Write a program non-recursive and recursive program to calculate Fibonacci numbers and analyse their time and space complexity.

fibonacci.py

```
a = 0
b = 1
n=int(input("Enter the number of terms in the sequence: "))
print(a,b,end=" ")
while(n-2):
    c=a+b
    a,b = b,c
    print(c,end=" ")
    n=n-1
```

Output:

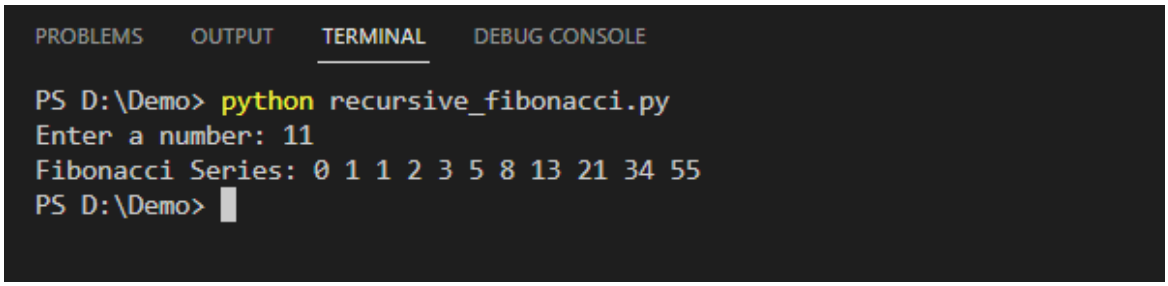
```
PS D:\Demo> & "C:/Program Files/Python39/python.exe" d:/Demo/fibonacci.py
Enter the number of terms in the sequence: 10
0 1 1 2 3 5 8 13 21 34
PS D:\Demo>
```

recursive_fibonacci.py

```
def recursive_fibonacci(n):
    if n <= 1:
        return n
    return recursive_fibonacci(n-1) + recursive_fibonacci(n-2)

if __name__ == "__main__":
    n = int(input("Enter a number: "))
    if n <=0:
        print("Please enter a Positive Number")
    else:
        print("Fibonacci Series:", end=" ")
        for i in range(n):
            print(recursive_fibonacci(i), end=" ")
```

Output:



Assignment-‘2’

Write a program to implement Huffman Encoding using a greedy strategy.

Hoffman.py

```
string = 'BCAADDDCCACACAC'
class NodeTree(object):
    def __init__(self, left=None, right=None):
        self.left = left
        self.right = right

    def children(self):
        return (self.left, self.right)

    def nodes(self):
        return (self.left, self.right)

    def __str__(self):
        return (self.left,"_", self.right)

def huffman_code_tree(node, left=True, binString=''):
    if type(node) is str:
        return {node: binString}
    (l, r) = node.children()
    d = dict()
    d.update(huffman_code_tree(l, True, binString + '0'))
    d.update(huffman_code_tree(r, False, binString + '1'))
    return d

freq = {}
for c in string:
    if c in freq:
```

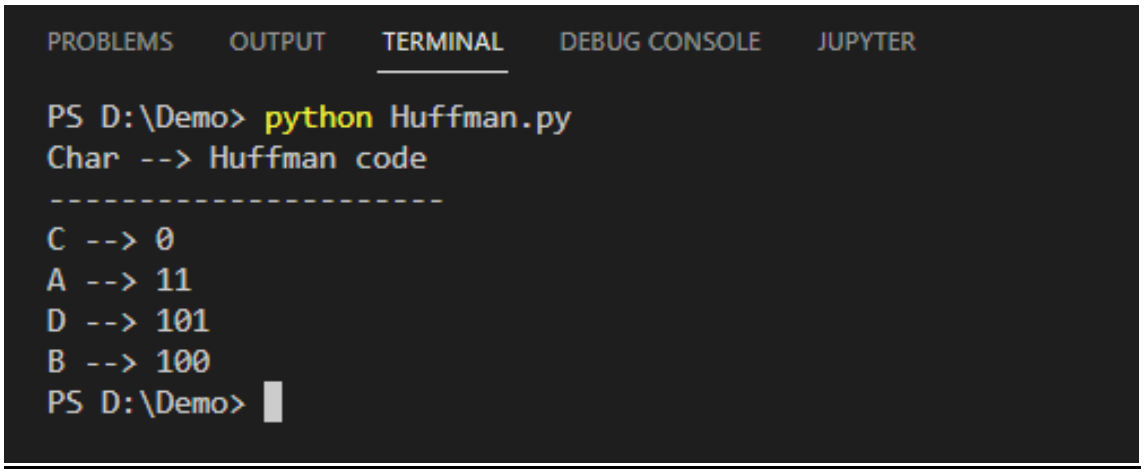
```
        freq[c] += 1
    else:
        freq[c] = 1

freq = sorted(freq.items(), key=lambda x: x[1], reverse=True)

nodes = freq

while len(nodes) > 1:
    (key1, c1) = nodes[-1]
    (key2, c2) = nodes[-2]
    nodes = nodes[:-2]
    node = NodeTree(key1, key2)
    nodes.append((node, c1 + c2))
    nodes = sorted(nodes, key=lambda x: x[1], reverse=True)
huffmanCode = huffman_code_tree(nodes[0][0])
print('Char --> Huffman code ')
print('----------------------')
for (char, frequency) in freq:
    print(char,"-->", huffmanCode[char])
```

Output:



Assignment-‘3’

Write a program to solve a fractional Knapsack problem using a greedy method.

fractional_knapsack.py

```
class Item:
    def __init__(self,value,weight):
        self.value = value
        self.weight = weight


def knapsack(w,arr):
    arr.sort(key=lambda x: (x.value/x.weight), reverse=True)
    '''for item in arr:
        print(item.value, item.weight, item.value/item.weight)'''
    finalvalue = 0.0
    for item in arr:
        if item.weight <= w:
            w -= item.weight
            finalvalue += item.value
        else:
            finalvalue += item.value * w/item.weight
            break
    return finalvalue


if __name__ == "__main__":

    # Weight of Knapsack
    knapsack_weight = 50
    arr = [Item(60, 10), Item(100, 20), Item(120, 30)]
```

```
# Function call
max_val = knapsack(knapsack_weight, arr)
print ('Maximum value we can obtain = {}'.format(max_val))
```

Output: