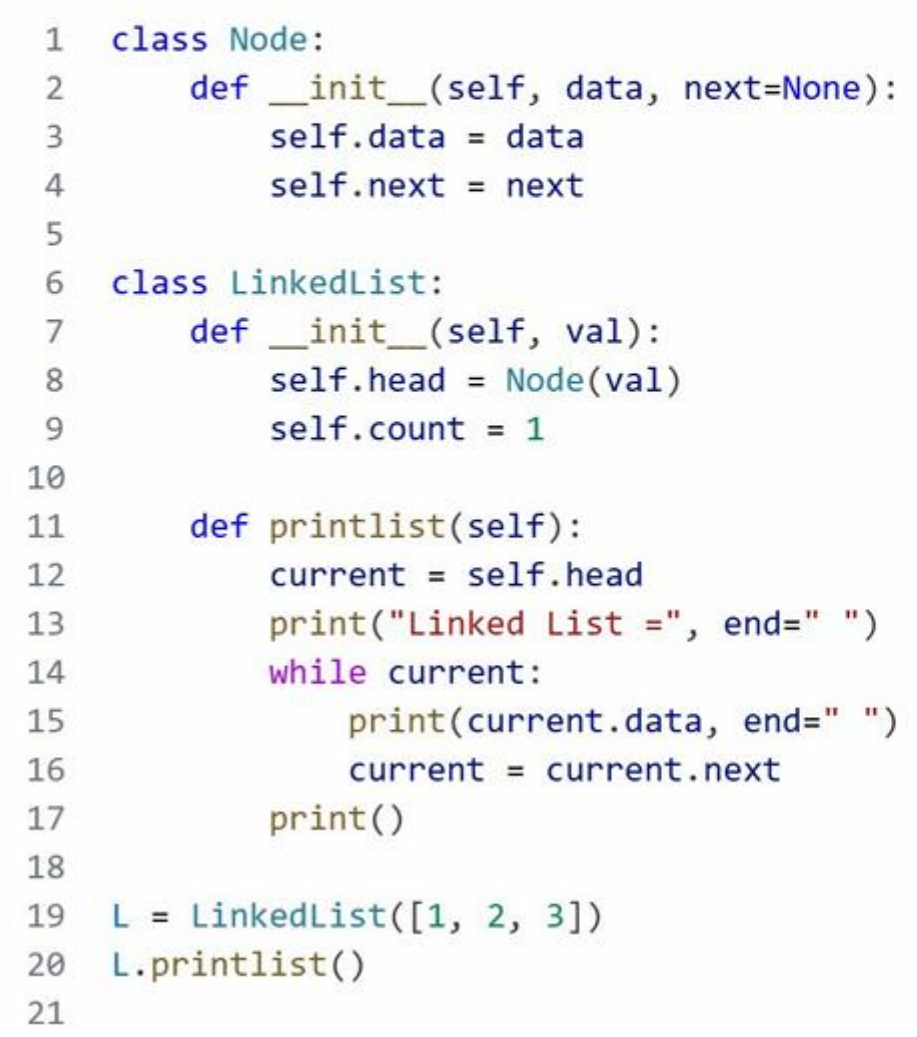
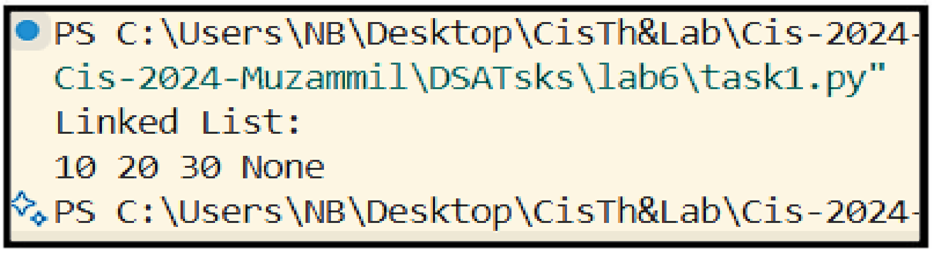
LAB 6

a)

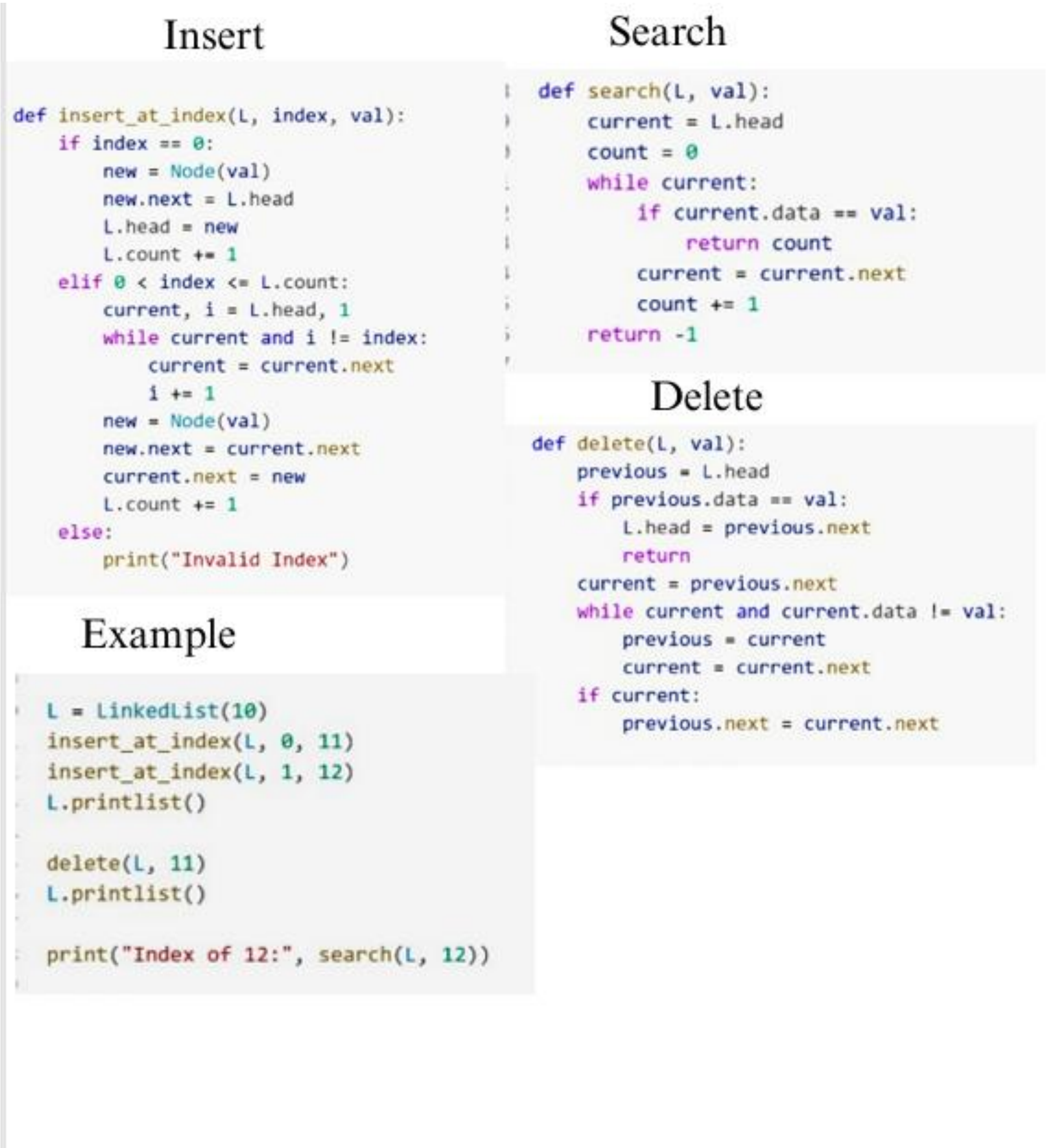


```python
class Node:
    def __init__(self, data, next=None):
        self.data = data
        self.next = next

class LinkedList:
    def __init__(self, val):
        self.head = Node(val)
        self.count = 1

    def printlist(self):
        current = self.head
        print("Linked List =", end=" ")
        while current:
            print(current.data, end=" ")
            current = current.next
        print()

L = LinkedList([1, 2, 3])
L.printlist()
```



```
PS C:\Users\NB\Desktop\CisTh&Lab\Cis-2024-
Cis-2024-Muzammil\DSATsks\lab6\task1.py"
Linked List:
10 20 30 None
PS C:\Users\NB\Desktop\CisTh&Lab\Cis-2024-
```

b)



Insert

```
def insert_at_index(L, index, val):
    if index == 0:
        new = Node(val)
        new.next = L.head
        L.head = new
        L.count += 1
    elif 0 < index <= L.count:
        current, i = L.head, 1
        while current and i != index:
            current = current.next
            i += 1
        new = Node(val)
        new.next = current.next
        current.next = new
        L.count += 1
    else:
        print("Invalid Index")
```

Search

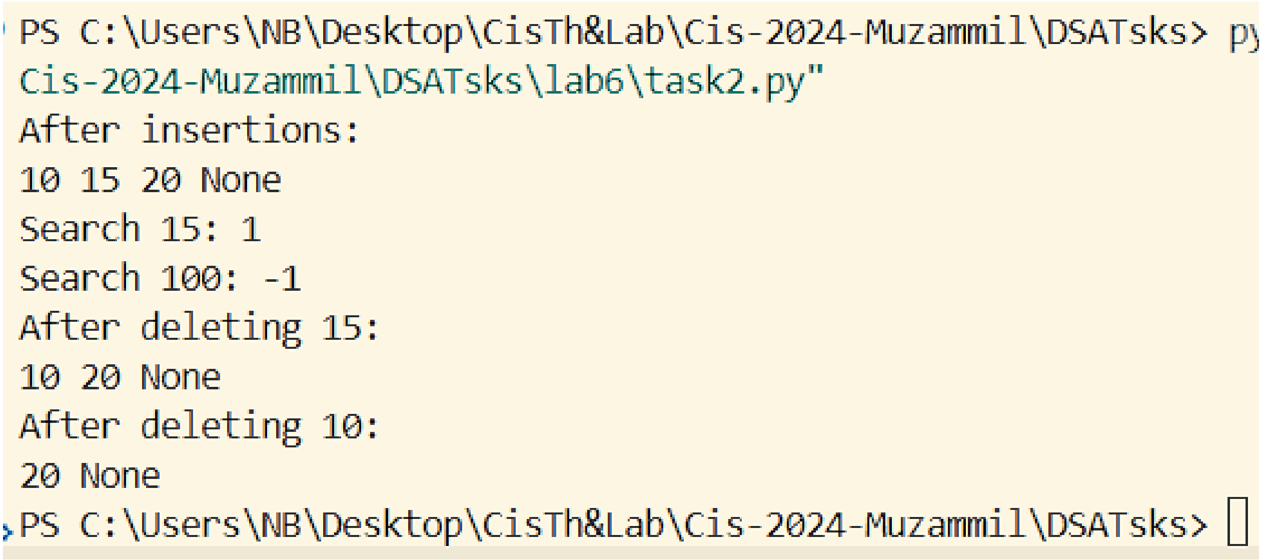
```
def search(L, val):
    current = L.head
    count = 0
    while current:
        if current.data == val:
            return count
        current = current.next
        count += 1
    return -1
```

Delete

```
def delete(L, val):
    previous = L.head
    if previous.data == val:
        L.head = previous.next
        return
    current = previous.next
    while current and current.data != val:
        previous = current
        current = current.next
    if current:
        previous.next = current.next
```

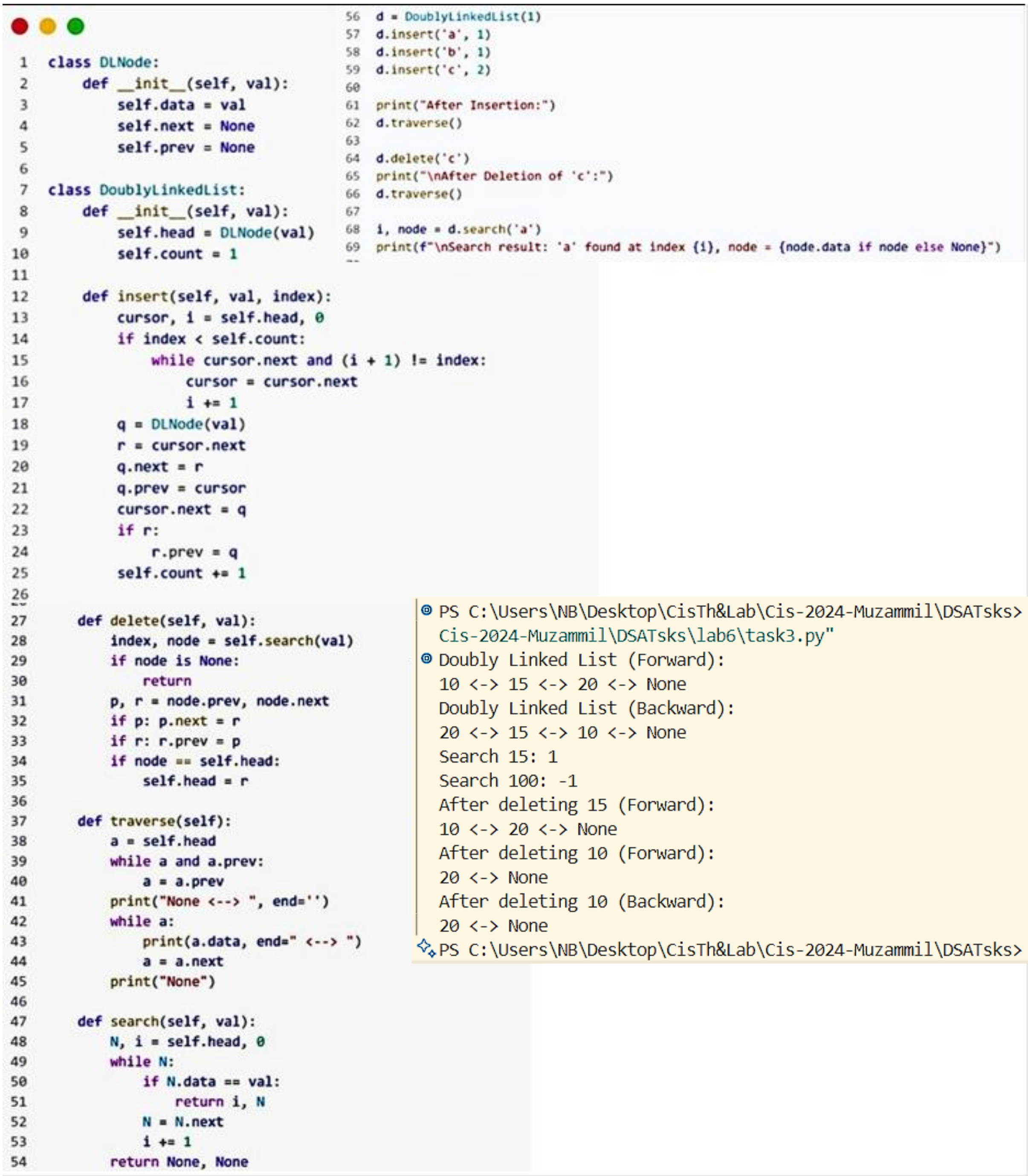
Example

```
L = LinkedList(10)
insert_at_index(L, 0, 11)
insert_at_index(L, 1, 12)
L.printlist()

delete(L, 11)
L.printlist()

print("Index of 12:", search(L, 12))
```



```
PS C:\Users\NB\Desktop\CisTh&Lab\Cis-2024-Muzammil\DSATsks> py
Cis-2024-Muzammil\DSATsks\lab6\task2.py"
After insertions:
10 15 20 None
Search 15: 1
Search 100: -1
After deleting 15:
10 20 None
After deleting 10:
20 None
PS C:\Users\NB\Desktop\CisTh&Lab\Cis-2024-Muzammil\DSATsks>
```

c)



```python
class DLNode:
    def __init__(self, val):
        self.data = val
        self.next = None
        self.prev = None

class DoublyLinkedList:
    def __init__(self, val):
        self.head = DLNode(val)
        self.count = 1

    def insert(self, val, index):
        cursor, i = self.head, 0
        if index < self.count:
            while cursor.next and (i + 1) != index:
                cursor = cursor.next
                i += 1
        q = DLNode(val)
        r = cursor.next
        q.next = r
        q.prev = cursor
        cursor.next = q
        if r:
            r.prev = q
        self.count += 1

    def delete(self, val):
        index, node = self.search(val)
        if node is None:
            return
        p, r = node.prev, node.next
        if p: p.next = r
        if r: r.prev = p
        if node == self.head:
            self.head = r

    def traverse(self):
        a = self.head
        while a and a.prev:
            a = a.prev
        print("None <--> ", end='')
        while a:
            print(a.data, end=" <--> ")
            a = a.next
        print("None")

    def search(self, val):
        N, i = self.head, 0
        while N:
            if N.data == val:
                return i, N
            N = N.next
            i += 1
        return None, None
```

```python
d = DoublyLinkedList(1)
d.insert('a', 1)
d.insert('b', 1)
d.insert('c', 2)

print("After Insertion:")
d.traverse()

d.delete('c')
print("\nAfter Deletion of 'c':")
d.traverse()

i, node = d.search('a')
print(f"\nSearch result: 'a' found at index {i}, node = {node.data if node else None}")
```

```
PS C:\Users\NB\Desktop\CisTh&Lab\Cis-2024-Muzammil\DSATsks>
Cis-2024-Muzammil\DSATsks\lab6\task3.py"
Doubly Linked List (Forward):
10 <-> 15 <-> 20 <-> None
Doubly Linked List (Backward):
20 <-> 15 <-> 10 <-> None
Search 15: 1
Search 100: -1
After deleting 15 (Forward):
10 <-> 20 <-> None
After deleting 10 (Forward):
20 <-> None
After deleting 10 (Backward):
20 <-> None
PS C:\Users\NB\Desktop\CisTh&Lab\Cis-2024-Muzammil\DSATsks>
```