DEPARTMENT OF COMPUTER SCIENCE CUI, VEHARI CAMPUS

Assignments no. 01

Subject:

Data Structure & Algorithm-Lab

Submitted to:

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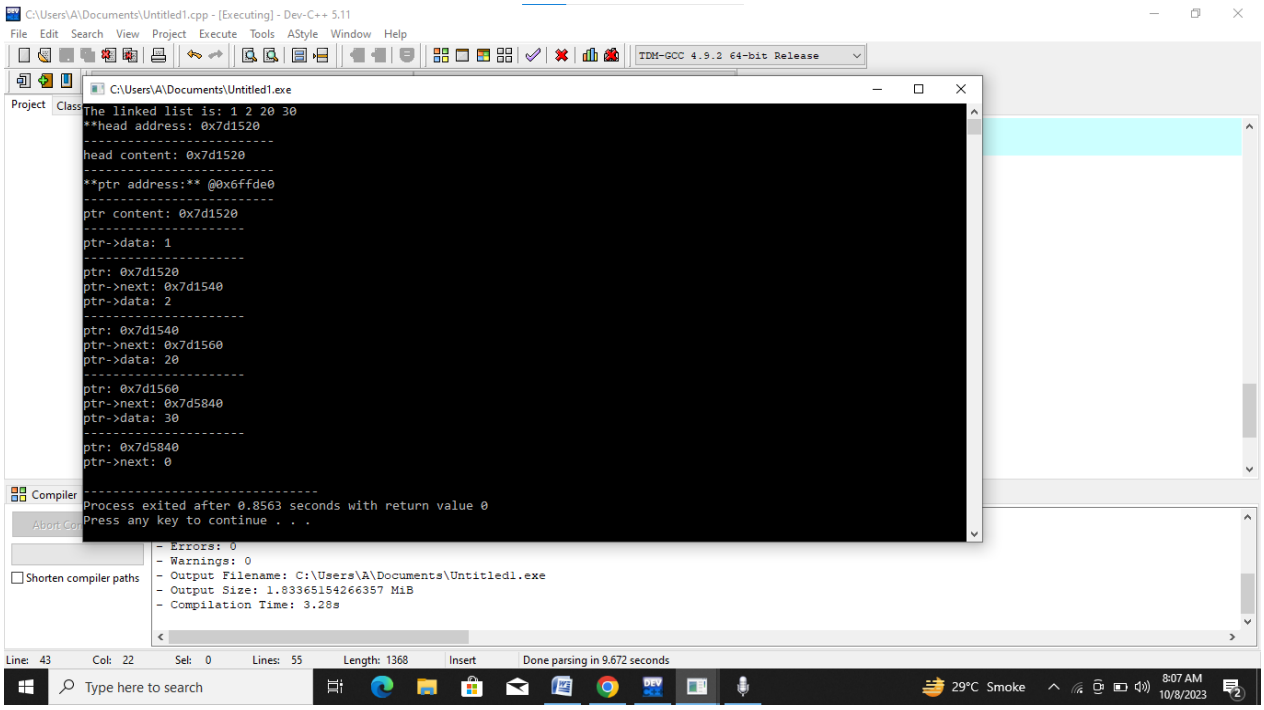
Activity No.1

```
#include <iostream>

using namespace std;


struct Node {

   int data;

   Node* next;

};


void displayLinkedList(Node* head) {

   cout << "The linked list is: ";

   Node* ptr = head;

   while (ptr != NULL) {

      cout << ptr->data << " ";

      ptr = ptr->next;

   }

   cout << endl << "**head address: " << head << endl;

   cout << "--------------------------" << endl;

   cout << "head content: " << head<< endl;

   cout << "--------------------------" << endl;

   cout << "**ptr address:** @" << &head << endl;

   cout << "--------------------------" << endl;

   cout << "ptr content: " << head << endl;

   cout << "----------------------" << endl;

   ptr = head;
```

```
    while (ptr != NULL) {
        cout << "ptr->data: " << ptr->data << endl;
        cout << "----------------------" << endl;
        cout << "ptr: " << ptr << endl;
        cout << "ptr->next: " << ptr->next << endl;
        ptr = ptr->next;
    }
}

int main() {
    Node* head = new Node();
    Node* second = new Node();
    Node* third = new Node();
    Node* fourth = new Node();

    head->data = 1;
    head->next = second;

    second->data = 2;
    second->next = third;

    third->data = 20;
    third->next = fourth;

    fourth->data = 30;
```

```
    fourth->next = NULL;

    displayLinkedList(head);

    return 0;
}
```



Activity No.2

```
#include <iostream>

// Define a simple Node structure for the linked list

struct Node {
```

```
    int data;
    Node* next;
    Node* prev; // For doubly linked list

    Node(int val) : data(val), next(nullptr), prev(nullptr) {}
};

// Class for the linked list operations
class LinkedList {
private:
    Node* head; // Pointer to the head of the list
    Node* tail; // Pointer to the tail of the list (for doubly linked list)
    bool isCircular;

public:
    LinkedList(bool circular = false) : head(nullptr), tail(nullptr), isCircular(circular) {}

    // Function to insert a node at the beginning of the list
    void insertAtBeginning(int value) {
        Node* newNode = new Node(value);
        if (isCircular) {
            if (head == nullptr) {
                newNode->next = newNode;
            } else {
                newNode->next = head;
```

```
            Node* lastNode = head;
            while (lastNode->next != head) {
                lastNode = lastNode->next;
            }
            lastNode->next = newNode;
        }
        head = newNode;
    } else {
        newNode->next = head;
        head = newNode;
    }
    std::cout << "Inserted successfully at the beginning." << std::endl;
}

// Function to insert a node at the end of the list
void insertAtEnd(int value) {
    Node* newNode = new Node(value);
    if (isCircular) {
        if (head == nullptr) {
            newNode->next = newNode;
            head = newNode;
        } else {
            newNode->next = head;
            Node* lastNode = head;
            while (lastNode->next != head) {
```

```
            lastNode = lastNode->next;
        }
        lastNode->next = newNode;
    }
  } else {
    if (head == nullptr) {
        head = newNode;
        tail = newNode;
    } else {
        tail->next = newNode;
        tail = newNode;
    }
  }
  std::cout << "Inserted successfully at the end." << std::endl;
}

// Function to insert a node after a specific data value
void insertAfterValue(int value, int target) {
  Node* newNode = new Node(value);
  Node* current = head;
  while (current != nullptr) {
    if (current->data == target) {
        newNode->next = current->next;
        current->next = newNode;
        std::cout << "Inserted successfully after " << target << "." << std::endl;
```

```
            return;
        }
        current = current->next;
    }
    std::cout << "Value " << target << " not found in the list." << std::endl;
}

// Function to display the linked list
void display() {
    Node* current = head;
    std::cout << "The items present in the list are: ";
    if (current == nullptr) {
        std::cout << "Empty";
    } else {
        if (isCircular) {
            do {
                std::cout << current->data << " ";
                current = current->next;
            } while (current != head);
        } else {
            while (current != nullptr) {
                std::cout << current->data << " ";
                current = current->next;
            }
        }
```

```
    }
    std::cout << std::endl;
}

// Function to reverse the linked list
void reverse() {
    Node* prev = nullptr;
    Node* current = head;
    Node* next = nullptr;
    while (current != nullptr) {
        next = current->next;
        current->next = prev;
        prev = current;
        current = next;
    }
    head = prev;
    std::cout << "List reversed." << std::endl;
}

// Function to seek a specific value in the linked list
void seekValue(int value) {
    Node* current = head;
    int position = 0;
    while (current != nullptr) {
        if (current->data == value) {
```

```
            std::cout << "Value " << value << " found at position " << position << "." << std::endl;
            return;
        }
        current = current->next;
        position++;
    }
    std::cout << "Value " << value << " not found in the list." << std::endl;
}

// Function to delete the entire linked list
void deleteList() {
    Node* current = head;
    while (current != nullptr) {
        Node* next = current->next;
        delete current;
        current = next;
    }
    head = nullptr;
    std::cout << "List deleted." << std::endl;
}

~LinkedList() {
    deleteList();
}
};
```

```
int main() {
    int choice;
    bool isCircular = false;
    LinkedList list(isCircular);

    do {
        std::cout << "Operations on List.." << std::endl;
        std::cout << "1. Insertion" << std::endl;
        std::cout << "2. Deletion" << std::endl;
        std::cout << "3. Display" << std::endl;
        std::cout << "4. Reverse" << std::endl;
        std::cout << "5. Seek" << std::endl;
        std::cout << "6. Exit" << std::endl;
        std::cout << "Enter your choice: ";
        std::cin >> choice;

        switch (choice) {
        case 1:
            int insertChoice;
            std::cout << "1. Insertion at the beginning" << std::endl;
            std::cout << "2. Insertion at the end" << std::endl;
            std::cout << "3. Insertion at a specific data node" << std::endl;
            std::cout << "Enter your choice: ";
            std::cin >> insertChoice;
```

```
    int insertValue;
    std::cout << "Enter the value to insert: ";
    std::cin >> insertValue;
    switch (insertChoice) {
    case 1:
        list.insertAtBeginning(insertValue);
        break;
    case 2:
        list.insertAtEnd(insertValue);
        break;
    case 3:
        int insertTarget;
        std::cout << "Enter the target value: ";
        std::cin >> insertTarget;
        list.insertAfterValue(insertValue, insertTarget);
        break;
    default:
        std::cout << "Invalid choice!" << std::endl;
        break;
    }
    break;
case 2:
    // Implement deletion options here (e.g., delete by value or position)
    // You can add these functions to the LinkedList class
    break;
```

```
case 3:
   list.display();
   break;
case 4:
   list.reverse();
   break;
case 5:
   int seekValue;
   std::cout << "Enter the value to seek: ";
   std::cin >> seekValue;
         list.seekValue(seekValue);
   break;
case 6:
   std::cout << "Exiting the program..." << std::endl;
   // Clean up the linked list memory
   list.deleteList();
   exit(0);
default:
   std::cout << "Invalid choice!" << std::endl;
   break;
}

std::cout << "Press any key to continue...";
std::cin.ignore();
std::cin.get();
```

```
    } while (choice != 6);


    return 0;

}
```