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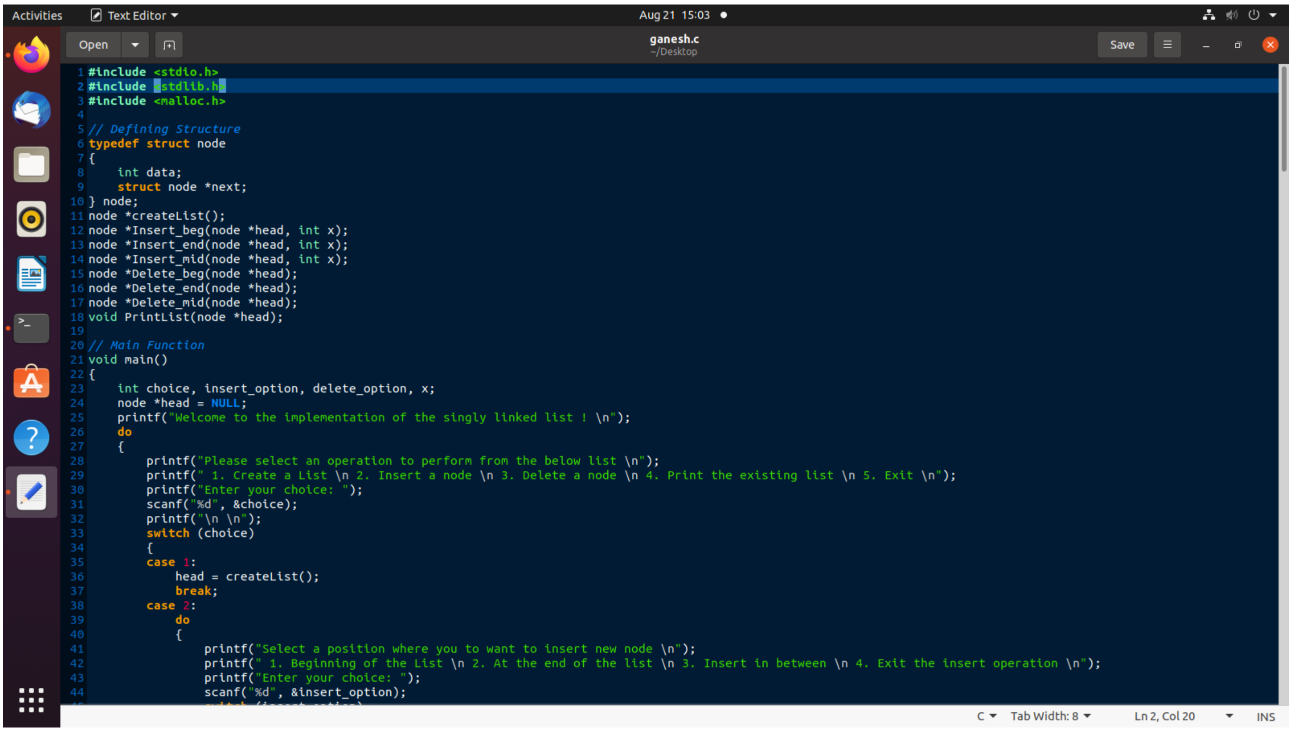
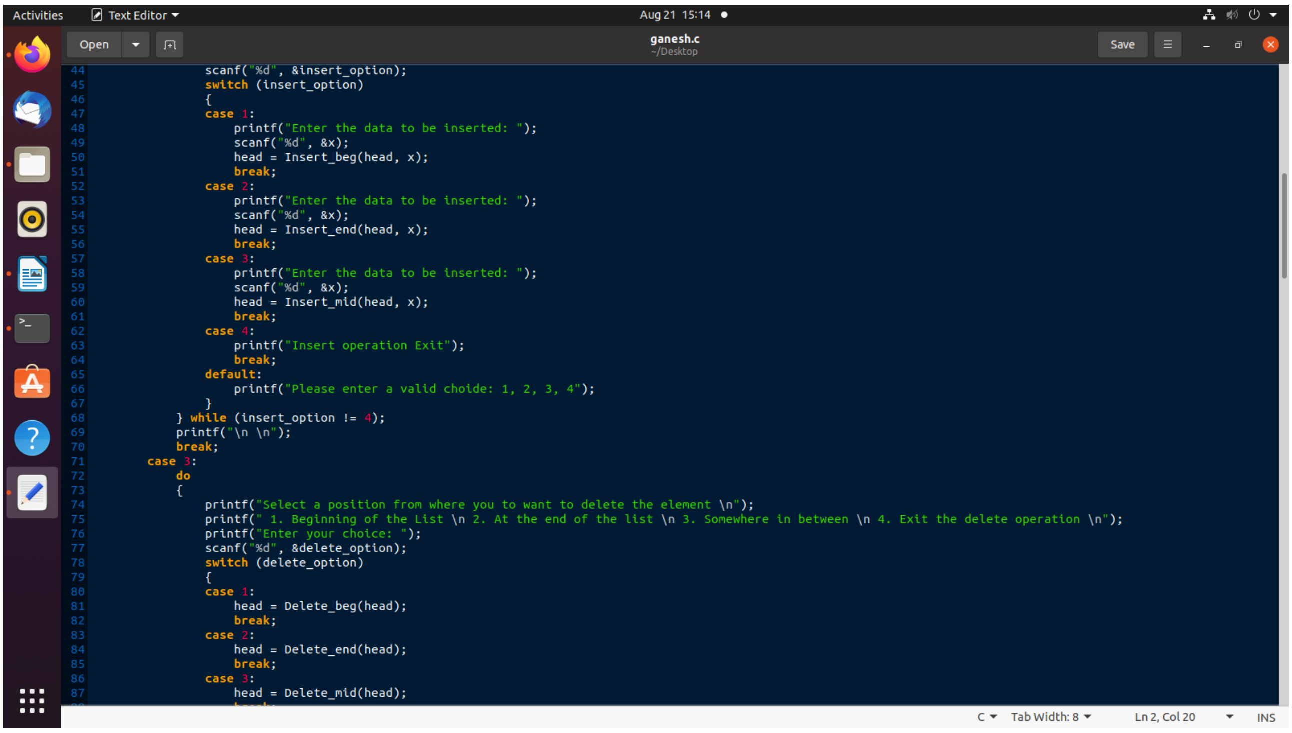
Class: SYIT Experiment No. 5

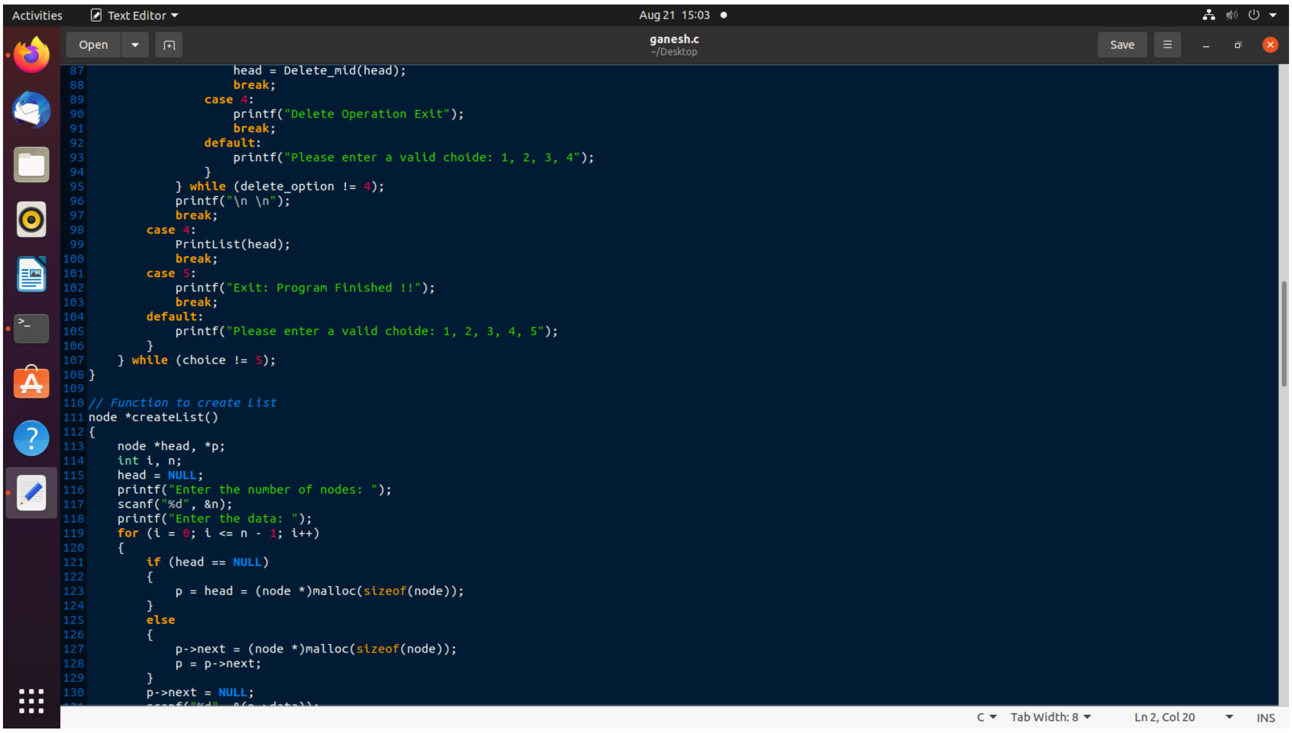
Program:



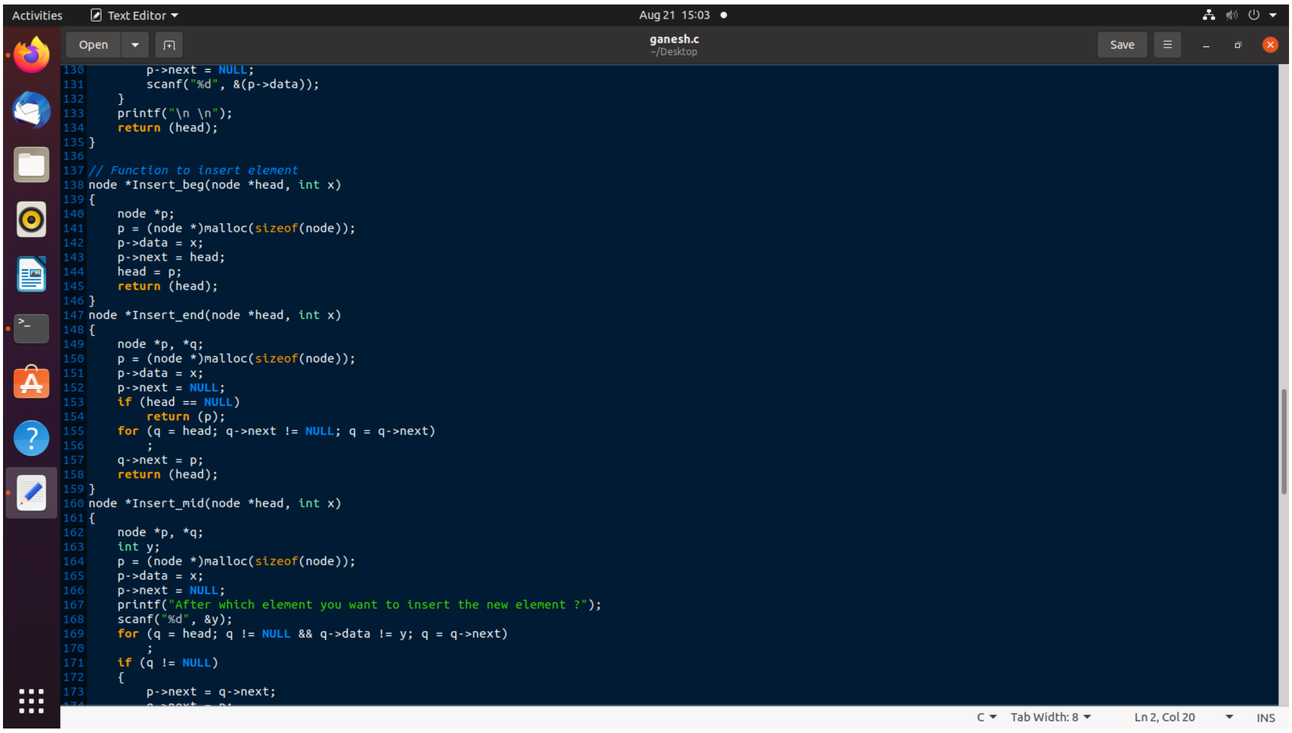
```c
#include <stdio.h>
#include <stdlib.h>
#include <malloc.h>

// Defining Structure
typedef struct node
{
    int data;
    struct node *next;
} node;
node *createList();
node *Insert_beg(node *head, int x);
node *Insert_end(node *head, int x);
node *Insert_mid(node *head, int x);
node *Delete_beg(node *head);
node *Delete_end(node *head);
node *Delete_mid(node *head);
void PrintList(node *head);

// Main Function
void main()
{
    int choice, insert_option, delete_option, x;
    node *head = NULL;
    printf("Welcome to the implementation of the singly linked list ! \n");
    do
    {
        printf("Please select an operation to perform from the below list \n");
        printf(" 1. Create a List \n 2. Insert a node \n 3. Delete a node \n 4. Print the existing list \n 5. Exit \n");
        printf("Enter your choice: ");
        scanf("%d", &choice);
        printf("\n \n");
        switch (choice)
        {
        case 1:
            head = createList();
            break;
        case 2:
            do
            {
                printf("Select a position where you to want to insert new node \n");
                printf(" 1. Beginning of the List \n 2. At the end of the list \n 3. Insert in between \n 4. Exit the insert operation \n");
                printf("Enter your choice: ");
                scanf("%d", &insert_option);
```



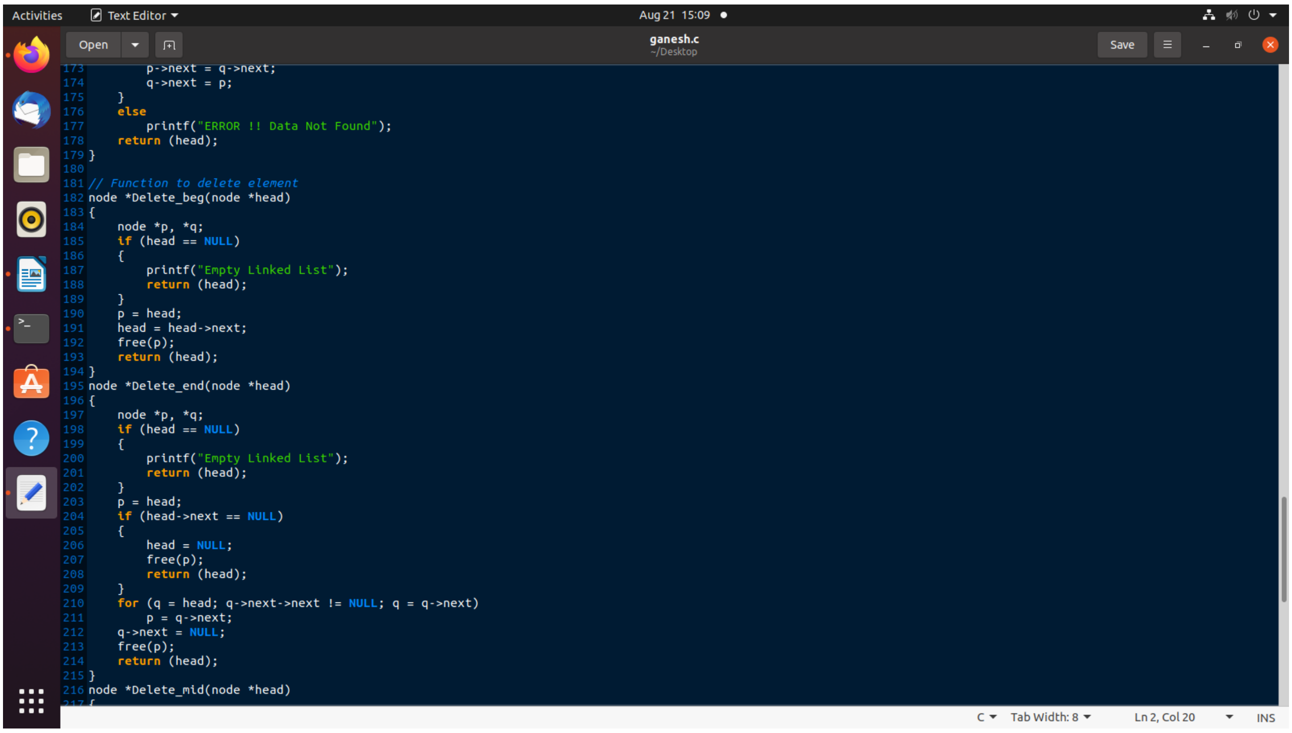
```c
                scanf("%d", &insert_option);
                switch (insert_option)
                {
                case 1:
                    printf("Enter the data to be inserted: ");
                    scanf("%d", &x);
                    head = Insert_beg(head, x);
                    break;
                case 2:
                    printf("Enter the data to be inserted: ");
                    scanf("%d", &x);
                    head = Insert_end(head, x);
                    break;
                case 3:
                    printf("Enter the data to be inserted: ");
                    scanf("%d", &x);
                    head = Insert_mid(head, x);
                    break;
                case 4:
                    printf("Insert operation Exit");
                    break;
                default:
                    printf("Please enter a valid choide: 1, 2, 3, 4");
                }
            } while (insert_option != 4);
            printf("\n \n");
            break;
        case 3:
            do
            {
                printf("Select a position from where you to want to delete the element \n");
                printf(" 1. Beginning of the List \n 2. At the end of the list \n 3. Somewhere in between \n 4. Exit the delete operation \n");
                printf("Enter your choice: ");
                scanf("%d", &delete_option);
                switch (delete_option)
                {
                case 1:
                    head = Delete_beg(head);
                    break;
                case 2:
                    head = Delete_end(head);
                    break;
                case 3:
                    head = Delete_mid(head);
```



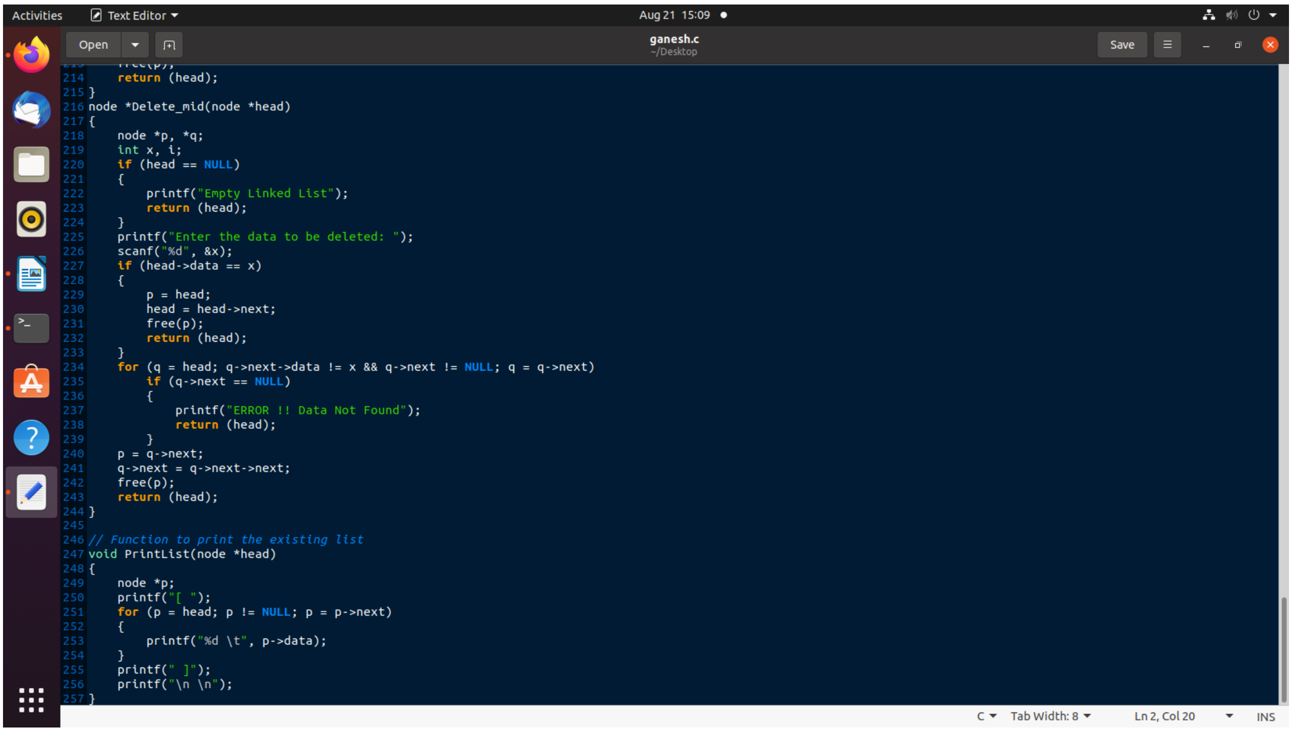
```c
                    head = Delete_mid(head);
                    break;
                case 4:
                    printf("Delete Operation Exit");
                    break;
                default:
                    printf("Please enter a valid choide: 1, 2, 3, 4");
                }
            } while (delete_option != 4);
            printf("\n \n");
            break;
        case 4:
            PrintList(head);
            break;
        case 5:
            printf("Exit: Program Finished !!");
            break;
        default:
            printf("Please enter a valid choide: 1, 2, 3, 4, 5");
        }
    } while (choice != 5);
}

// Function to create List
node *createList()
{
    node *head, *p;
    int i, n;
    head = NULL;
    printf("Enter the number of nodes: ");
    scanf("%d", &n);
    printf("Enter the data: ");
    for (i = 0; i <= n - 1; i++)
    {
        if (head == NULL)
        {
            p = head = (node *)malloc(sizeof(node));
        }
        else
        {
            p->next = (node *)malloc(sizeof(node));
            p = p->next;
        }
        p->next = NULL;
        scanf("%d", &(p->data));
```



```c
        p->next = NULL;
        scanf("%d", &(p->data));
    }
    printf("\n \n");
    return (head);
}

// Function to insert element
node *Insert_beg(node *head, int x)
{
    node *p;
    p = (node *)malloc(sizeof(node));
    p->data = x;
    p->next = head;
    head = p;
    return (head);
}
node *Insert_end(node *head, int x)
{
    node *p, *q;
    p = (node *)malloc(sizeof(node));
    p->data = x;
    p->next = NULL;
    if (head == NULL)
        return (p);
    for (q = head; q->next != NULL; q = q->next)
        ;
    q->next = p;
    return (head);
}
node *Insert_mid(node *head, int x)
{
    node *p, *q;
    int y;
    p = (node *)malloc(sizeof(node));
    p->data = x;
    p->next = NULL;
    printf("After which element you want to insert the new element ?");
    scanf("%d", &y);
    for (q = head; q != NULL && q->data != y; q = q->next)
        ;
    if (q != NULL)
    {
        p->next = q->next;
        q->next = p;
```

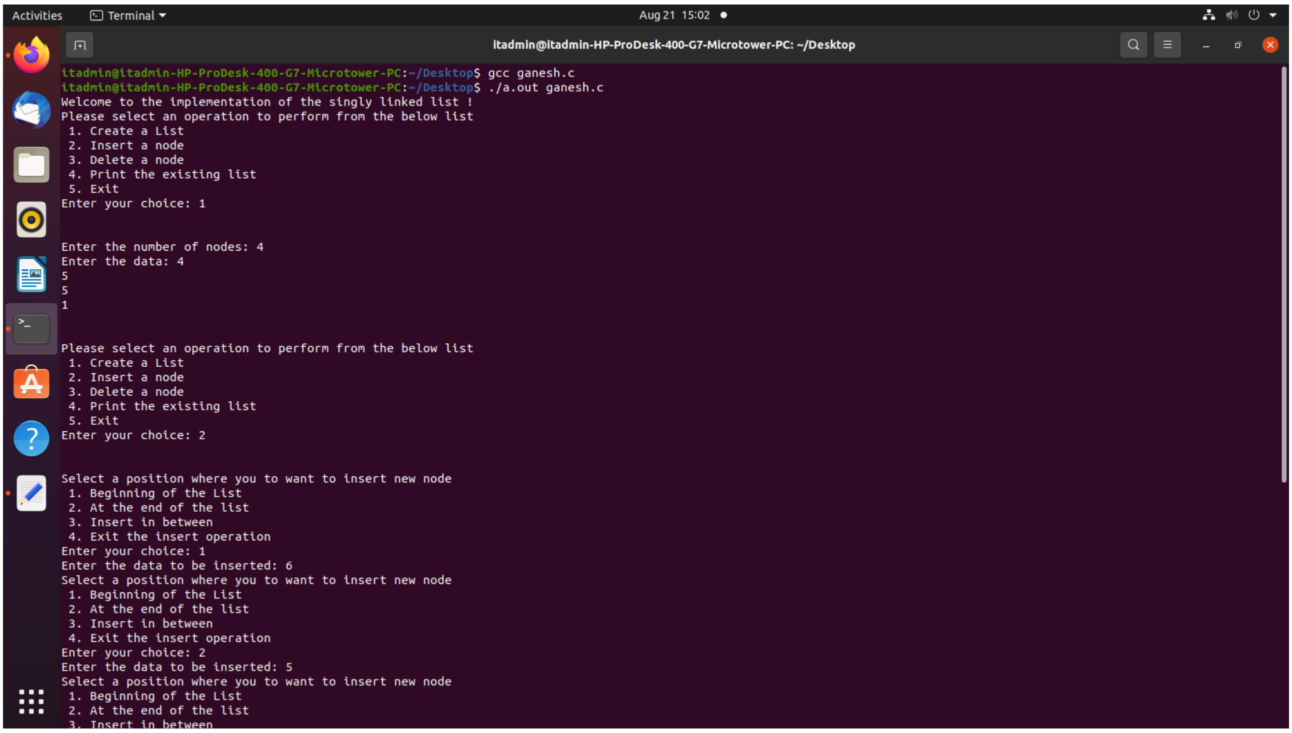


```c
        p->next = q->next;
        q->next = p;
    }
    else
        printf("ERROR !! Data Not Found");
    return (head);
}

// Function to delete element
node *Delete_beg(node *head)
{
    node *p, *q;
    if (head == NULL)
    {
        printf("Empty Linked List");
        return (head);
    }
    p = head;
    head = head->next;
    free(p);
    return (head);
}
node *Delete_end(node *head)
{
    node *p, *q;
    if (head == NULL)
    {
        printf("Empty Linked List");
        return (head);
    }
    p = head;
    if (head->next == NULL)
    {
        head = NULL;
        free(p);
        return (head);
    }
    for (q = head; q->next->next != NULL; q = q->next)
        p = q->next;
    q->next = NULL;
    free(p);
    return (head);
}
node *Delete_mid(node *head)
```

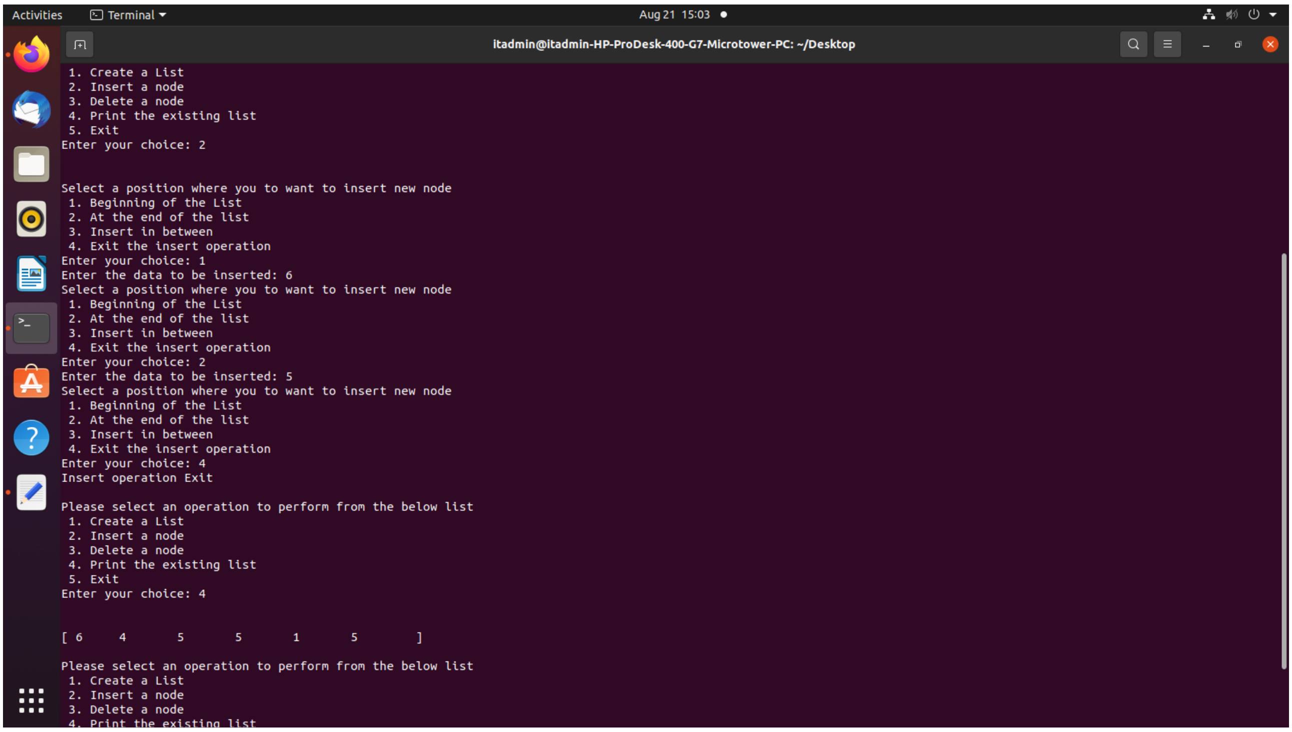


```c
    return (head);
}
node *Delete_mid(node *head)
{
    node *p, *q;
    int x, i;
    if (head == NULL)
    {
        printf("Empty Linked List");
        return (head);
    }
    printf("Enter the data to be deleted: ");
    scanf("%d", &x);
    if (head->data == x)
    {
        p = head;
        head = head->next;
        free(p);
        return (head);
    }
    for (q = head; q->next->data != x && q->next != NULL; q = q->next)
        if (q->next == NULL)
        {
            printf("ERROR !! Data Not Found");
            return (head);
        }
    p = q->next;
    q->next = q->next->next;
    free(p);
    return (head);
}

// Function to print the existing list
void PrintList(node *head)
{
    node *p;
    printf("[ ");
    for (p = head; p != NULL; p = p->next)
    {
        printf("%d \t", p->data);
    }
    printf(" ]");
    printf("\n \n");
}
```

Output:



```
itadmin@itadmin-HP-ProDesk-400-G7-Microtower-PC:~/Desktop$ gcc ganesh.c
itadmin@itadmin-HP-ProDesk-400-G7-Microtower-PC:~/Desktop$ ./a.out ganesh.c
Welcome to the implementation of the singly linked list !
Please select an operation to perform from the below list
 1. Create a List
 2. Insert a node
 3. Delete a node
 4. Print the existing list
 5. Exit
Enter your choice: 1


Enter the number of nodes: 4
Enter the data: 4
5
5
1


Please select an operation to perform from the below list
 1. Create a List
 2. Insert a node
 3. Delete a node
 4. Print the existing list
 5. Exit
Enter your choice: 2


Select a position where you to want to insert new node
 1. Beginning of the List
 2. At the end of the list
 3. Insert in between
 4. Exit the insert operation
Enter your choice: 1
Enter the data to be inserted: 6
Select a position where you to want to insert new node
 1. Beginning of the List
 2. At the end of the list
 3. Insert in between
 4. Exit the insert operation
Enter your choice: 2
Enter the data to be inserted: 5
Select a position where you to want to insert new node
 1. Beginning of the List
 2. At the end of the list
 3. Insert in between
```



```
 1. Create a List
 2. Insert a node
 3. Delete a node
 4. Print the existing list
 5. Exit
Enter your choice: 2


Select a position where you to want to insert new node
 1. Beginning of the List
 2. At the end of the list
 3. Insert in between
 4. Exit the insert operation
Enter your choice: 1
Enter the data to be inserted: 6
Select a position where you to want to insert new node
 1. Beginning of the List
 2. At the end of the list
 3. Insert in between
 4. Exit the insert operation
Enter your choice: 2
Enter the data to be inserted: 5
Select a position where you to want to insert new node
 1. Beginning of the List
 2. At the end of the list
 3. Insert in between
 4. Exit the insert operation
Enter your choice: 4
Insert operation Exit

Please select an operation to perform from the below list
 1. Create a List
 2. Insert a node
 3. Delete a node
 4. Print the existing list
 5. Exit
Enter your choice: 4


[ 6      4       5       5       1       5        ]

Please select an operation to perform from the below list
 1. Create a List
 2. Insert a node
 3. Delete a node
 4. Print the existing list
```