Lab 1:

Question 1 :

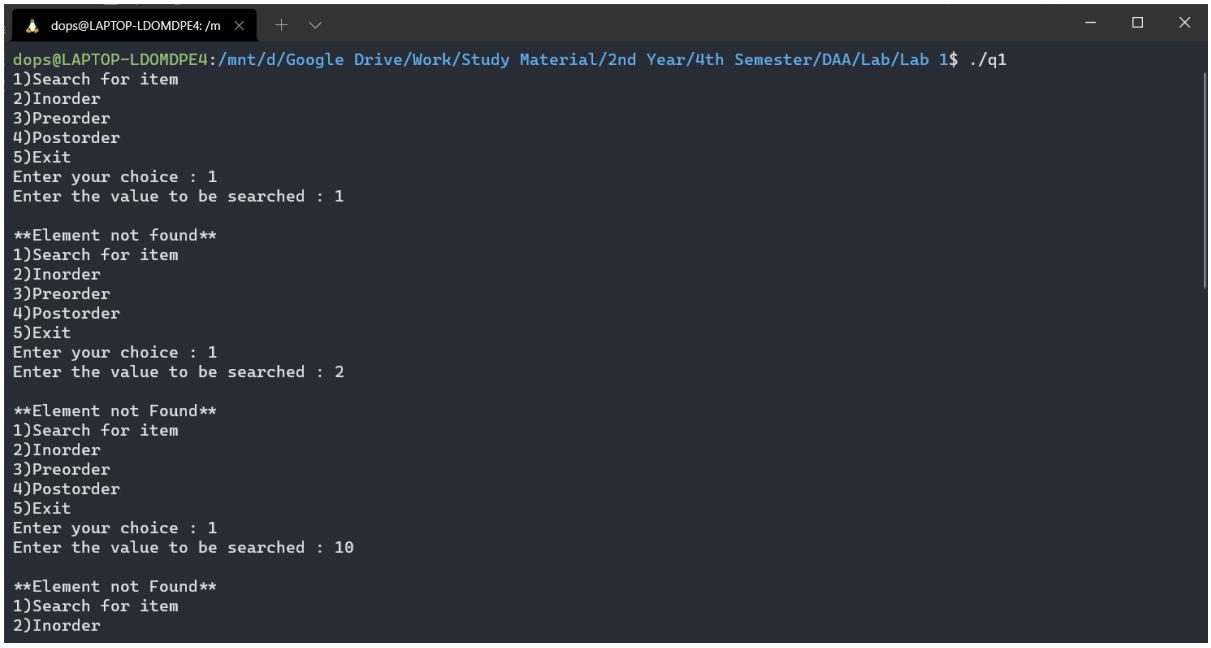
```c
#include <stdio.h>
#include <stdlib.h>

typedef struct node
{
 struct node *left;
 struct node *right;
 int val;
} * Node;

void inorder(Node tree)
{
 if (tree)
 {
  inorder(tree->left);
  printf("%d\t", tree->val);
  inorder(tree->right);
 }
}

void preorder(Node tree)
{
 if (tree)
 {
  printf("%d\t", tree->val);
  preorder(tree->left);
  preorder(tree->right);
 }
}

void postorder(Node tree)
```

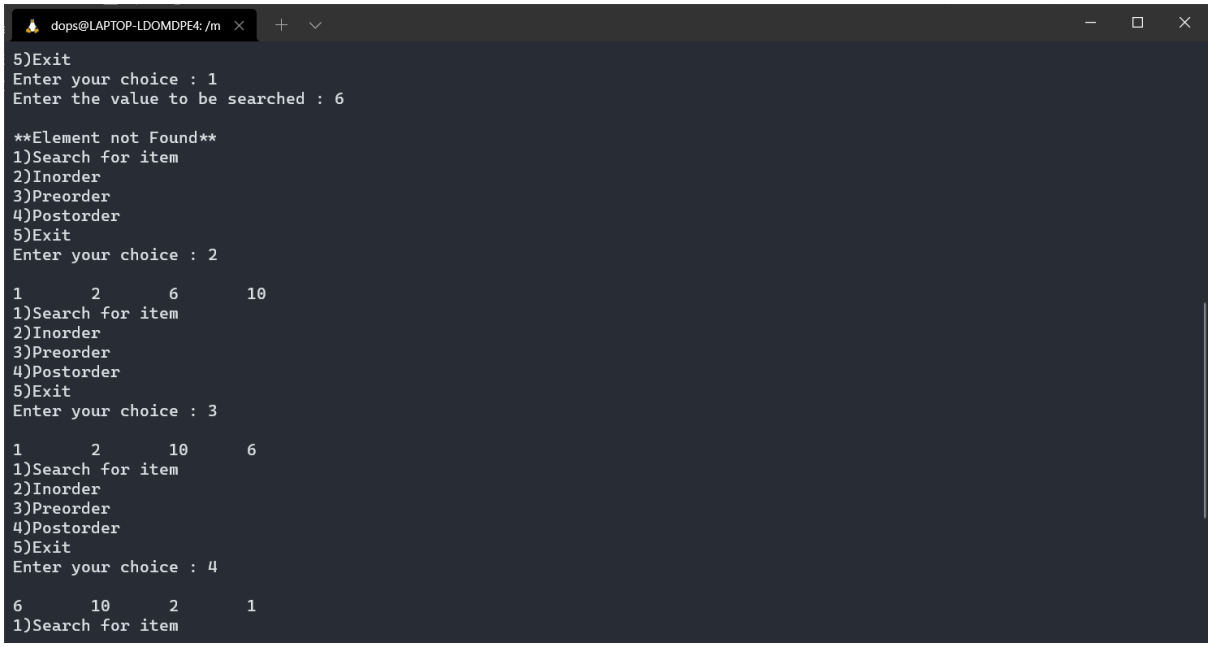
```
{
 if (tree)
 {
  postorder(tree->left);
  postorder(tree->right);
  printf("%d\t", tree->val);
 }
}

void insert(Node *tree, int val)
{
 Node n = malloc(sizeof(struct node));
 n->val = val;
 n->left = NULL;
 n->right = NULL;
 if (*tree == NULL)
 {
  *tree = n;
  return;
 }
 Node cur = *tree;
 Node prev = *tree;
 while (cur)
 {
  prev = cur;
  if ((cur->val) < val)
  {
   cur = cur->right;
  }
  else if ((cur->val) > val)
  {
   cur = cur->left;
  }
 }
```

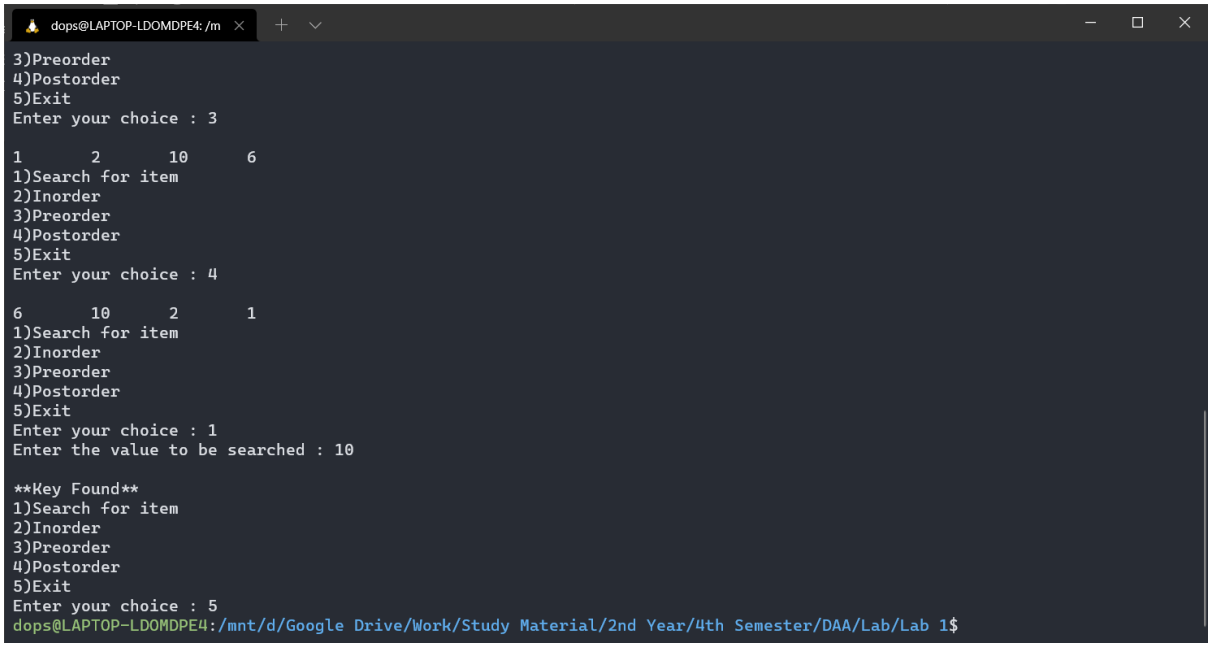
```
 if (val > prev->val)
 {
  prev->right = n;
 }
 if (val < prev->val)
 {
  prev->left = n;
 }
}

void search(Node *tree, int val)
{
 if (*tree == NULL)
 {
  printf("\n**Element not found**\n");
  insert(tree, val);
  return;
 }
 Node cur = *tree;
 while (cur)
 {
  if (cur->val == val)
  {
   printf("\n**Key Found**\n");
   return;
  }
  else if (cur->val > val)
  {
   cur = cur->left;
  }
  else if (cur->val < val)
  {
   cur = cur->right;
  }
```

```
 }
 printf("\n**Element not Found**\n");
 insert(tree, val);
}

int main()
{
 int choice = 0, inp;
 Node tree = NULL;
 while (choice < 5)
 {
  printf("1)Search for item\n2)Inorder\n3)Preorder\n4)Po
storder\n5)Exit\n");
  printf("Enter your choice : ");
  scanf("%d", &choice);
  switch (choice)
  {
  case 1:
   printf("Enter the value to be searched : ");
   scanf("%d", &inp);
   search(&tree, inp);
   break;
  case 2:
   printf("\n");
   if (tree == NULL)
   {
    printf("Tree is Empty, nothing to print.\n");
    continue;
   }
   inorder(tree);
   printf("\n");
   break;
  case 3:
   printf("\n");
```

```
   if (tree == NULL)
   {
    printf("Tree is Empty, nothing to print.\n");
    continue;
   }
   preorder(tree);
   printf("\n");
   break;
  case 4:
   printf("\n");
   if (tree == NULL)
   {
    printf("Tree is Empty, nothing to print.\n");
    continue;
   }
   postorder(tree);
   printf("\n");
   break;
  default:
   continue;
  }
 }
 return 0;
}
```


dops@LAPTOP-LDOMDPE4: /m
dops@LAPTOP-LDOMDPE4:/mnt/d/Google Drive/Work/Study Material/2nd Year/4th Semester/DAA/Lab/Lab 1$ ./q1
1)Search for item
2)Inorder
3)Preorder
4)Postorder
5)Exit
Enter your choice : 1
Enter the value to be searched : 1
Element not found
1)Search for item
2)Inorder
3)Preorder
4)Postorder
5)Exit
Enter your choice : 1
Enter the value to be searched : 2
Element not Found
1)Search for item
2)Inorder
3)Preorder
4)Postorder
5)Exit
Enter your choice : 1
Enter the value to be searched : 10
Element not Found
1)Search for item
2)Inorder


dops@LAPTOP-LDOMDPE4: /m
5)Exit
Enter your choice : 1
Enter the value to be searched : 6
Element not Found
1)Search for item
2)Inorder
3)Preorder
4)Postorder
5)Exit
Enter your choice : 2
1 2 6 10
1)Search for item
2)Inorder
3)Preorder
4)Postorder
5)Exit
Enter your choice : 3
1 2 10 6
1)Search for item
2)Inorder
3)Preorder
4)Postorder
5)Exit
Enter your choice : 4
6 10 2 1
1)Search for item



Question 2 :

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

typedef struct listNode
{
 int n;
 struct listNode *next;
} *ListNode;

typedef struct list
{
 struct listNode *head;
} *List;

typedef struct graph
{
 int val;
 struct list *array;
} *Graph;
```

```
ListNode newListNode(int d)
{
 ListNode newNode = (ListNode)malloc(sizeof(struct listNo
de));
 newNode->n = d;
 newNode->next = NULL;
 return newNode;
}

Graph newGraph(int v)
{
 Graph newGraph = (Graph)malloc(sizeof(struct graph));
 newGraph->val = v;
 newGraph->array = (List)calloc(v, sizeof(struct list));

 for (int i = 0; i < v; i++)
 {
  newGraph->array[i].head = NULL;
 }
 return newGraph;
}

void insertEdge(Graph g, int first, int second)
{
 ListNode newNode = newListNode(second);
 newNode->next = g->array[first].head;
 g->array[first].head = newNode;

 newNode = newListNode(first);
 newNode->next = g->array[second].head;
 g->array[second].head = newNode;
}
```

```
void displayList(Graph g)
{
 for (int i = 0; i < g->val; i++)
 {
  ListNode l = g->array[i].head;
  printf("List of vertex %d\n", i);
  while (l->next)
  {
   printf("%d -> ", l->n);
   l = l->next;
  }
  printf("%d\n", l->n);
 }
}

void insertEdgeM(int **matrix, int first, int second)
{
 matrix[first][second] = 1;
 matrix[second][first] = 1;
}

void displayMatrix(int **matrix, int n)
{
 for (int i = -1; i < n; i++)
 {
  if (i != -1)
   printf("%d -> ", i);
  for (int j = 0; j < n; j++)
  {
   if (i == -1)
   {
    if (j == 0)
    {
     printf("\t");
```

```
    }
    printf("%d\t", j);
    continue;
   }
   if (j == 0)
   {
    printf("\t");
   }
   printf("%d\t", matrix[i][j]);
  }
  printf("\n");
 }
}

int main()
{
 int num = 4;
 Graph g = newGraph(num);
 insertEdge(g, 1, 3);
 insertEdge(g, 0, 2);
 insertEdge(g, 1, 2);
 insertEdge(g, 2, 3);
 displayList(g);
 printf("\n");
 int **matrix = (int **)calloc(num, sizeof(int *));
 for (int i = 0; i < num; i++)
 {
  matrix[i] = (int *)calloc(num, sizeof(int));
  for (int j = 0; j < num; j++)
  {
   matrix[i][j] = 0;
  }
 }
 insertEdgeM(matrix, 1, 3);
```

```
    insertEdgeM(matrix, 0, 2);
    insertEdgeM(matrix, 1, 2);
    insertEdgeM(matrix, 2, 3);
    displayMatrix(matrix, num);
    return 0;
}
```