Lab 8
Q1

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

typedef struct node * nodeptr;

typedef struct node
{
   nodeptr rlink, llink;
   int data;
}node;

nodeptr create()
{
   nodeptr temp = malloc(sizeof(node));
   return temp;
}

void insert(nodeptr *n,int x)
{
   if(*n == NULL)
   {
      *n = create();
      (*n)->data = x;
      (*n)->llink = (*n)->rlink = *n;
   }
   else
   {
      nodeptr temp = *n;
      while(temp->llink != *n)
         temp = temp->llink;

      nodeptr newnode = create();
      newnode->data = x;
      temp->llink = newnode;
      newnode->rlink = temp;
      newnode->llink = *n;
      (*n)->rlink = newnode;
   }
}

nodeptr readlong()
{
   nodeptr head;
   char str[100];
   int i;
   printf("Enter the integers you would like to ADD : ");
   scanf("%s",str);
   nodeptr n = create();
   n->llink = n->rlink = n;
```

```
    for(i=0;str[i];i++)
        insert(&n,str[i]-'0');
    return n;
}

nodeptr addlong(nodeptr A, nodeptr B)
{
    int digit, sum, carry=0;
    nodeptr head,r,R,a,b;
    a=A->rlink;
    b=B->rlink;
    head = create();
    head->llink = head->rlink = head;
    while(a!=A && b!=B)
    {
        sum = a->data + b->data +carry;
        digit = sum%10;
        carry = sum/10;
        insert(&head,digit);
        a=a->rlink;
        b=b->rlink;
    }
    if(a!=A)
    {
        r=a;
        R=A;
    }
    else
    {
        r=b;
        R=B;
    }
    while(r!=R)
    {
        sum = r->data + carry;
        digit = sum%10;
        carry = sum/10;
        insert(&head,digit);
        r = r->rlink;
    }
    if(carry)
        insert(&head,carry);
    return head;
}

void display(nodeptr *n)
{
    for(nodeptr temp=(*n)->rlink;temp!=*n;temp=temp->rlink)
        printf("%d ",temp->data);
    printf("\n");
}
```

```
int main()
{
   nodeptr A,B,sum;
   A = readlong();
   B = readlong();
   sum = addlong(A,B);
   printf("Sum : ");
   display(&sum);
   return 0;
}
```

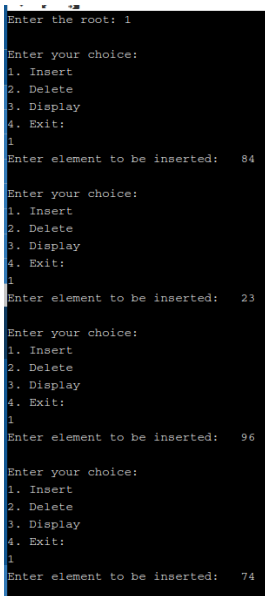
```
Enter the integers you would like to ADD : 21
Enter the integers you would like to ADD : 14
Sum : 3 5
```

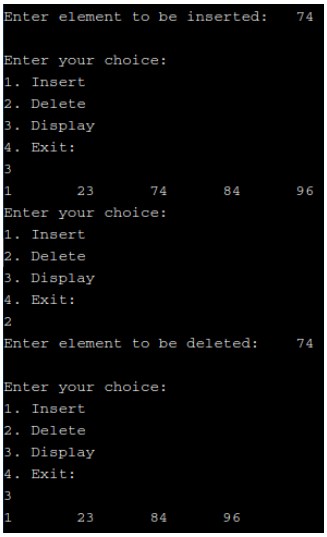
Q2

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

#define MAX 10

typedef struct node
{
   int key;
   struct node *left, *right;
}* NODE;

typedef struct
{
   NODE S[MAX];
   int tos;
}STACK;

NODE newNODE (int item)
{
   NODE temp = (NODE)malloc(sizeof(struct node));
   temp->key = item;
   temp->left = temp->right = NULL;
   return temp;
}

void push (STACK *s, NODE n)
{
   s->S[++(s->tos)] = n;
}

NODE pop (STACK *s)
{
   return s->S[(s->tos)--];
}
```

```
void inorder (NODE root)
{
   NODE curr;
   curr = root;
   STACK S;
   S.tos = -1;

   push(&S, root);
   curr = curr->left;
   while (S.tos != -1 || curr != NULL)
   {
      while (curr != NULL)
      {
         push(&S, curr);
         curr = curr->left;
      }
      curr = pop(&S);
      printf("%d\t", curr->key);
      curr = curr->right;
   }
}

NODE insert (NODE node, int key)
{
   if (node == NULL)
      return newNODE(key);
   if (key < node->key)
      node->left = insert(node->left, key);
   else if (key > node->key)
      node->right = insert(node->right, key);
   return node;
}

NODE minValueNode (NODE node)
{
   NODE current = node;
   while (current && current->left != NULL)
      current = current->left;
   return current;
}

NODE deleteNode (NODE root, int key)
{
   if (root == NULL)
      return root;
   if (key < root->key)
      root->left = deleteNode(root->left, key);
   else if (key > root->key)
      root->right = deleteNode(root->right, key);
   else
   {
      if (root->left == NULL)
```

```
        {
            NODE temp = root->right;
            free(root);
            return temp;
        }
        else if (root->right == NULL)
        {
            NODE temp = root->left;
            free(root);
            return temp;
        }
        NODE temp = minValueNode(root->right);
        root->key = temp->key;
        root->right = deleteNode(root->right, temp->key);
    }
    return root;
}

void main()
{
    NODE root = NULL;
    int k;
    printf("Enter the root:\t");
    scanf("%d", &k);
    root = insert(root, k);
    int ch;
    do
    {
        printf("\nEnter your choice:");
        printf("\n1. Insert\n2. Delete\n3. Display\n4. Exit:\n");
        scanf("%d", &ch);
        switch (ch)
        {
            case 1:
                printf("Enter element to be inserted:\t");
                scanf("%d", &k);
                root = insert(root, k);
                break;

            case 2:
                printf("Enter element to be deleted:\t");
                scanf("%d", &k);
                root = deleteNode(root, k);
                break;

            case 3:
                inorder(root);
                break;
        }
    } while (ch < 4);
}
```


Enter the root: 1
Enter your choice:
1. Insert
2. Delete
3. Display
4. Exit:
1
Enter element to be inserted: 84
Enter your choice:
1. Insert
2. Delete
3. Display
4. Exit:
1
Enter element to be inserted: 23
Enter your choice:
1. Insert
2. Delete
3. Display
4. Exit:
1
Enter element to be inserted: 96
Enter your choice:
1. Insert
2. Delete
3. Display
4. Exit:
1
Enter element to be inserted: 74


Enter element to be inserted: 74
Enter your choice:
1. Insert
2. Delete
3. Display
4. Exit:
3
1 23 74 84 96
Enter your choice:
1. Insert
2. Delete
3. Display
4. Exit:
2
Enter element to be deleted: 74
Enter your choice:
1. Insert
2. Delete
3. Display
4. Exit:
3
1 23 84 96