DSA Lab

Week 8 Assignment Submission

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Batch B1

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1) **Add two long positive integers represented using circular doubly linked list with header node.**

Code:

```
#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 string representing long int : ");
    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;
```

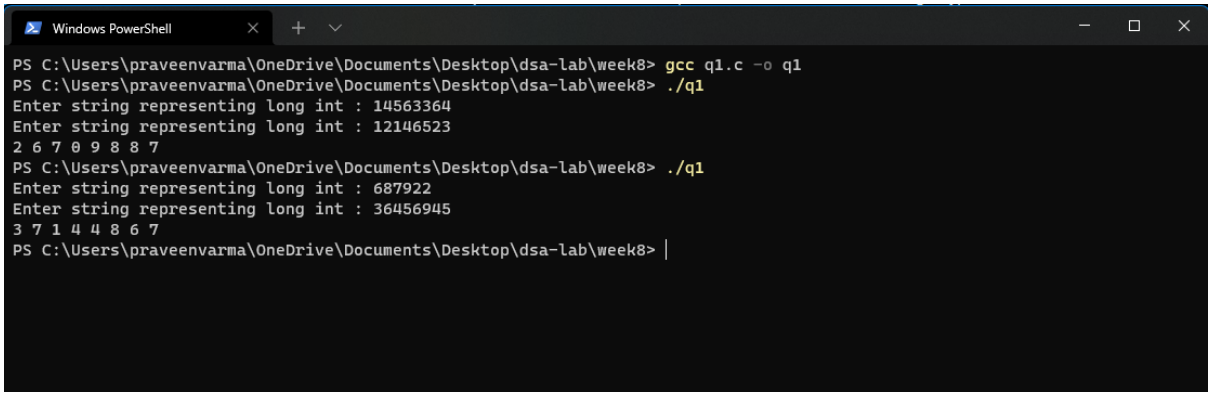
```
        b = b->rlink;
    }
    if (a != A)
    {
        r = a;
        R = A;
    }
    else
    {
        r = b;
        R = B;
    }
    while (r != R)
    {
        sum = r->data + carry;
        digit = sum % 10;
        carry = sum / 10;
        insert(&head, digit);
        r = r->rlink;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

Sample input/output:



2) Write a menu driven program to do the following using iterative functions:

i) To create a BST for a given set of integer numbers

ii) To delete a given element from BST.

iii) Display the elements using iterative in-order traversal

Code:

```
#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)
{
```

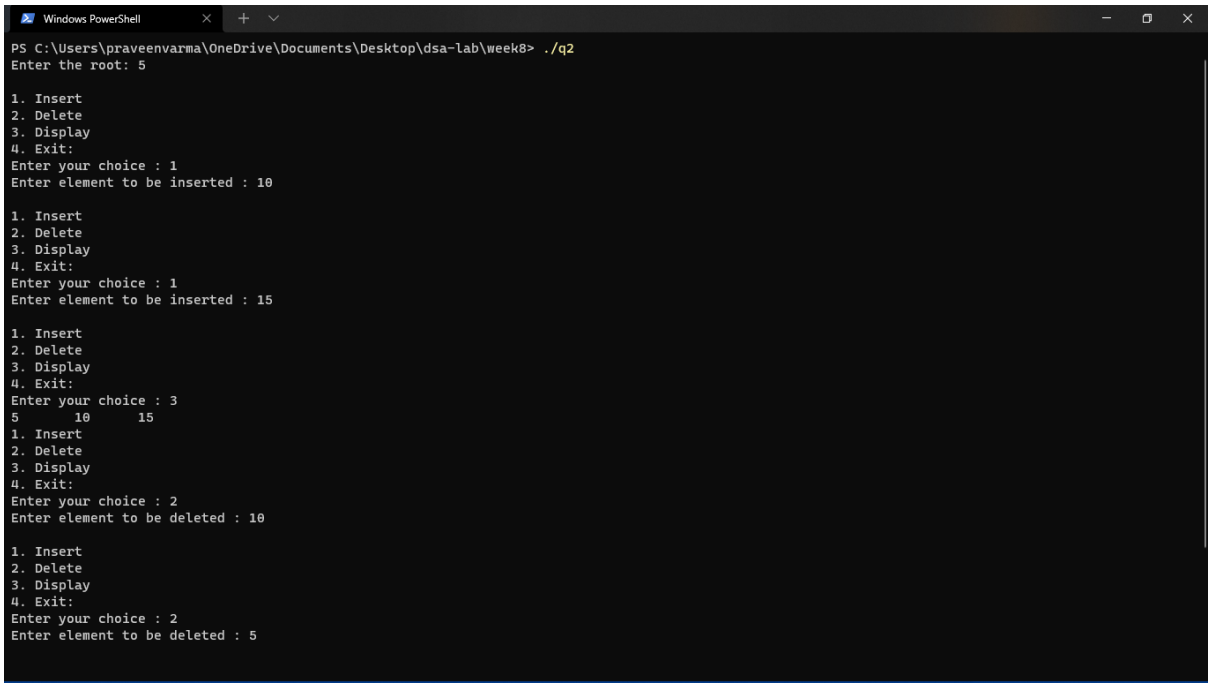
```
    NODE curr;
    curr = root;
    STACK S;
    S.tos = -1;
    push(&S, root);
    curr = curr->left;
    while (S.tos != -1 || curr != NULL)
    {
        while (curr != NULL)
        {
            push(&S, curr);
            curr = curr->left;
        }
        curr = pop(&S);
        printf("%d\t", 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;
}
int main()
{
    NODE root = NULL;
    int k;
    printf("Enter the root:\t");
    scanf("%d", &k);
    root = insert(root, k);
    int ch;
    while (1)
    {
        printf("\n1. Insert\n2. Delete\n3. Display\n4. Exit:\n");
        printf("Enter your choice : ");
        scanf("%d", &ch);
        switch (ch)
        {
        case 1:
            printf("Enter element to be inserted : ");
            scanf("%d", &k);
            root = insert(root, k);
            break;
        case 2:
            printf("Enter element to be deleted : ");
            scanf("%d", &k);
            root = deleteNode(root, k);
```

```
            break;
        case 3:
            inorder(root);
            break;
        case 4:
            return 0;
        }
    }
}
```

Sample input/output:



THANK YOU!