

DATA STRUCTURE PRACTICAL NO : 01

Practical No. 1: Implement Stack ADT using array.

PROGRAM

```

/*      KAZI AWAIZ SALIM      DSE 22-23      COMP      */
#include <iostream>
using namespace std;
int stack[100], n=100, top=-1;
void push(int val) {
    if(top>=n-1)
        cout<<"Stack Overflow"<<endl;
    else {
        top++;
        stack[top]=val;
    }
}
void pop() {
    if(top<=-1)
        cout<<"Stack Underflow"<<endl;
    else {
        cout<<"The popped element is "<< stack[top] <<endl;
        top--;
    }
}
void display() {
    if(top>=0) {
        cout<<"Stack elements are: ";
        for(int i=top; i>=0; i--)
            cout<<stack[i]<<" ";
        cout<<endl;
    } else
        cout<<"Stack is empty\n";
}
int main() {
    int ch, val;
    cout<<"1) Push in stack"<<endl;
    cout<<"2) Pop from stack"<<endl;
    cout<<"3) Display stack"<<endl;
    cout<<"4) Exit"<<endl<<endl;
    do {
        cout<<"Enter your choice: ";
        cin>>ch;
        switch(ch) {
            case 1: {
                cout<<"Enter value to be pushed:"<<endl;
                cin>>val;
                push(val);
                break;
            }
            case 2: {
                pop();
                break;
            }
        }
    } while(ch>0 && ch<5);
}

```

```

    }
    case 3: {
        display();
        break;
    }
    case 4: {
        cout<<"Exit"<<endl;
        break;
    }
    default: {
        cout<<"Invalid Choice"<<endl;
    }
}
}while(ch!=4);
return 0;
}

```

OUTPUT OF PR 1

The screenshot displays the Visual Studio Code interface with a C++ file named 'Exp_1.cpp' open. The code implements a stack using an array. It includes a menu-driven interface with options to push, pop, display, or exit. The terminal output shows the program's execution with user input and corresponding stack operations.

```

DS Practicals Using C++ > Exp_1.cpp > pop()
1  /*      KAZI AWAIZ SALIM
2
3  #include <iostream>
4  using namespace std;
5  int stack[100], n=100, top=-1;
6  void push(int val) {
7      if(top>=n-1)
8          cout<<"Stack Overflow"<<endl;
9      else {
10         top++;
11         stack[top]=val;
12     }
13 }
14 void pop() {
15     if(top<=-1)
16         cout<<"Stack Underflow"<<endl;
17     else {
18         top--;
19         cout<<stack[top]<<endl;
20     }
21 }
22 int main() {
23     int ch;
24     while(ch!=4) {
25         cout<<endl<<endl;
26         cout<<"1. Push\n2. Pop\n3. Display\n4. Exit\n";
27         int choice;
28         cout<<"Enter your choice: ";
29         cin>>choice;
30         switch(choice) {
31             case 1: {
32                 int val;
33                 cout<<"Enter value to be pushed: ";
34                 cin>>val;
35                 push(val);
36                 break;
37             }
38             case 2: {
39                 pop();
40                 break;
41             }
42             case 3: {
43                 display();
44                 break;
45             }
46             case 4: {
47                 cout<<"Exit"<<endl;
48                 break;
49             }
50             default: {
51                 cout<<"Invalid Choice"<<endl;
52             }
53         }
54     }
55 }
56 return 0;
57 }

```

Terminal Output:

```

Enter your choice: 1
Enter value to be pushed: 21
Enter your choice: 2
The popped element is 21
Enter your choice: 2
Stack Underflow
Enter your choice: 1
Enter value to be pushed: 89
Enter your choice: 3
Stack elements are: 89
Enter your choice: 1
Enter value to be pushed: 76
Enter your choice: 3
Stack elements are: 76 89
Enter your choice: 4

```



DATA STRUCTURE PRACTICAL NO : 02
Practical No. 2 : Convert an Infix expression to Postfix expression using stack ADT.

PROGRAM

```

/*      KAZI AWAIZ SALIM      DSE 22-23      COMP      */
#include <iostream>
#include <stack>
using namespace std;

bool isOperator(char c)
{
    if (c == '+' || c == '-' || c == '*' || c == '/' || c == '^')
    {
        return true;
    }
    else
    {
        return false;
    }
}

int precedence(char c)
{
    if (c == '^')
        return 3;
    else if (c == '*' || c == '/')
        return 2;
    else if (c == '+' || c == '-')
        return 1;
    else
        return -1;
}

string InfixToPostfix(stack<char> s, string infix)
{
    string postfix;
    for (int i = 0; i < infix.length(); i++)
    {
        if ((infix[i] >= 'a' && infix[i] <= 'z') || (infix[i] >= 'A' && infix[i] <= 'Z'))
        {
            postfix += infix[i];
        }
        else if (infix[i] == '(')
        {
            s.push(infix[i]);
        }
        else if (infix[i] == ')')
    
```

```

{
    while ((s.top() != '(') && (!s.empty()))
    {
        char temp = s.top();
        postfix += temp;
        s.pop();
    }
    if (s.top() == '(')
    {
        s.pop();
    }
}
else if (isOperator(infix[i]))
{
    if (s.empty())
    {
        s.push(infix[i]);
    }
    else
    {
        if (precedence(infix[i]) > precedence(s.top()))
        {
            s.push(infix[i]);
        }
        else if ((precedence(infix[i]) == precedence(s.top())) && (infix[i] == '^'))
        {
            s.push(infix[i]);
        }
        else
        {
            while ((!s.empty()) && (precedence(infix[i]) <= precedence(s.top())))
            {
                postfix += s.top();
                s.pop();
            }
            s.push(infix[i]);
        }
    }
}
}

while (!s.empty())
{
    postfix += s.top();
    s.pop();
}

return postfix;
}

int main()
{

```

```

string infix_exp, postfix_exp;
cout << "Enter a Infix Expression :" << endl;
cin >> infix_exp;
stack<char> stack;
cout << "INFIX EXPRESSION: " << infix_exp << endl;
postfix_exp = InfixToPostfix(stack, infix_exp);
cout << endl
    << "POSTFIX EXPRESSION: " << postfix_exp;

return 0;
}

```

OUTPUT OF PR 2

The screenshot shows the Visual Studio Code editor with a C++ file named 'Exp_2.cpp'. The code implements a function to convert an infix expression to a postfix expression using a stack. The terminal output shows the program running and the user entering the infix expression 'A+B*D-C'. The program outputs the infix expression and the resulting postfix expression 'ABD*+C-'.

```

1  /* KAZI AWAIZ SALIM DSE 22-23 COMP */
2  #include <iostream>
3  #include <stack>
4  using namespace std;
5
6  bool isOperator(char c)
7  {
8      if (c == '+' || c == '-' || c == '*' || c == '/' || c == '^')
9      {
10         return true;
11     }
12     else
13     {
14         return false;
15     }
16 }
17
18 int precedence(char c)
19 {
20     if (c == '^')
21         return 3;
22     else if (c == '*' || c == '/')
23         return 2;

```

Warning: PowerShell detected that you might be using a screen reader and has disabled PSReadLine for compatibility purposes. If you want to re-enable it, run 'Import-Module PSReadLine'.

```

PS C:\Users\Owaiz\OneDrive\Desktop\Sem 3 Degree BE> cd "c:\Users\Owaiz\OneDrive\Desktop\Sem 3 Degree BE\DS Practicals Using C++\" ; if ($?) { g++ Exp_2.cpp -o Exp_2 } ; if ($?) { . \Exp_2 }
Enter a Infix Expression :
A+B*D-C
INFIX EXPRESSION: A+B*D-C
POSTFIX EXPRESSION: ABD*+C-
PS C:\Users\Owaiz\OneDrive\Desktop\Sem 3 Degree BE\DS Practicals Using C++>

```



Practical No. 3 : Applications of Stack ADT.

PROGRAM

```
/*      KAZI AWAIZ SALIM      DSE 22-23      COMP      */
#include <iostream>
using namespace std;
int stack[100], n=100, top=-1;
void push(int val) {
    if(top>=n-1)
        cout<<"Stack Overflow"<<endl;
    else {
        top++;
        stack[top]=val;
    }
}
void pop() {
    if(top<=-1)
        cout<<"Stack Underflow"<<endl;
    else {
        cout<<"The popped element is "<< stack[top] <<endl;
        top--;
    }
}
void display() {
    if(top>=0) {
        cout<<"Stack elements are: ";
        for(int i=top; i>=0; i--)
            cout<<stack[i]<<" ";
        cout<<endl;
    } else
        cout<<"Stack is empty\n";
}
int main() {
    int ch, val;
    cout<<"1) Push in stack"<<endl;
    cout<<"2) Pop from stack"<<endl;
    cout<<"3) Display stack"<<endl;
    cout<<"4) Exit"<<endl<<endl;
    do {
        cout<<"Enter your choice: ";
        cin>>ch;
        switch(ch) {
            case 1: {
                cout<<"Enter value to be pushed:"<<endl;
                cin>>val;
                push(val);
                break;
            }
            case 2: {
                pop();
            }
        }
    } while(ch>0 && ch<5);
}
```

```

        break;
    }
    case 3: {
        display();
        break;
    }
    case 4: {
        cout<<"Exit"<<endl;
        break;
    }
    default: {
        cout<<"Invalid Choice"<<endl;
    }
}

}while(ch!=4);
return 0;
}

```

OUTPUT OF PR NO 3

```

1  /* KAZI AWAIZ SALIM
2  #include <iostream>
3  using namespace std;
4  int stack[100], n=100, top=-1;
5  void push(int val) {
6      if(top>=n-1)
7          cout<<"Stack Overflow"<<endl;
8      else {
9          top++;
10         stack[top]=val;
11     }
12 }
13 void pop() {
14     if(top<=-1)
15         cout<<"Stack Underflow"<<endl;
16     else {

```

TERMINAL OUTPUT:

```

Enter your choice: 1
Enter value to be pushed:
21
Enter your choice: 2
The popped element is 21
Enter your choice: 2
Stack Underflow
Enter your choice: 1
Enter value to be pushed:
89
Enter your choice: 3
Stack elements are: 89
Enter your choice: 1
Enter value to be pushed:
76
Enter your choice: 3
Stack elements are: 76 89
Enter your choice:

```



Practical No. 4 : Implement Priority Queue ADT using array.

PROGRAM

```
/*    KAZI AWAIZ SALIM                                COMPUTER                DSE 22 - 23    */
// C++ program for the above approach FOR ENQUEUE , DEQUEUE
#include <bits/stdc++.h>
using namespace std;

// Structure for the elements in the
// priority queue
struct item {
    int value;
    int priority;
};

// Store the element of a priority queue
item pr[100000];

// Pointer to the last index
int size = -1;

// Function to insert a new element
// into priority queue
void enqueue(int value, int priority)
{
    // Increase the size
    size++;

    // Insert the element
    pr[size].value = value;
    pr[size].priority = priority;
}

// Function to check the top element
int peek()
{
    int highestPriority = INT_MIN;
    int ind = -1;

    // Check for the element with
    // highest priority
    for (int i = 0; i <= size; i++) {

        // If priority is same choose
        // the element with the
        // highest value
        if (highestPriority
            == pr[i].priority
            && ind > -1
```



```
        && pr[ind].value
        < pr[i].value) {
            highestPriority = pr[i].priority;
            ind = i;
        }
    else if (highestPriority
            < pr[i].priority) {
        highestPriority = pr[i].priority;
        ind = i;
    }
}

// Return position of the element
return ind;
}

// Function to remove the element with
// the highest priority
void dequeue()
{
    // Find the position of the element
    // with highest priority
    int ind = peek();

    // Shift the element one index before
    // from the position of the element
    // with highest priority is found
    for (int i = ind; i < size; i++) {
        pr[i] = pr[i + 1];
    }
    // Decrease the size of the
    // priority queue by one
    size--;
}

// Driver Code
int main()
{
    // Function Call to insert elements
    // as per the priority
    enqueue(10, 2);
    enqueue(14, 4);
    enqueue(16, 4);
    enqueue(12, 3);

    // Stores the top element
    // at the moment
    int ind = peek();

    cout << pr[ind].value << endl;
```

```

// Dequeue the top element
dequeue();

// Check the top element
ind = peek();
cout << pr[ind].value << endl;

// Dequeue the top element
dequeue();

// Check the top element
ind = peek();
cout << pr[ind].value << endl;

return 0;
}

```

OUTPUT OF PR NO 4

The screenshot shows the Visual Studio Code interface with a C++ file named 'Exp_4.c++' open. The code implements a priority queue using an array and a pointer to the last index. It includes functions for enqueueing and dequeuing elements. The terminal output shows the execution of the program, which prints the values of the elements in the priority queue.

```

1  /* KAZI AWAIZ SALIM COMPUTER DSE 22 - 23 */
2  // C++ program for the above approach FOR ENQUEUE , DEQUEUE
3  #include <bits/stdc++.h>
4  using namespace std;
5
6  // Structure for the elements in the
7  // priority queue
8  struct item {
9      int value;
10     int priority;
11 };
12
13 // Store the element of a priority queue
14 item pr[100000];
15
16 // Pointer to the last index
17 int size = -1;
18
19 // Function to insert a new element
20 // into priority queue
21 void enqueue(int value, int priority)

```

Warning: PowerShell detected that you might be using a screen reader and has disabled PSReadline for compatibility purposes. If you want to re-enable it, run 'Import-Module PSReadline'.

```

PS C:\Users\Owaiz\OneDrive\Desktop\Sem 3 Degree BE> cd "C:\Users\Owaiz\OneDrive\Desktop\Sem 3 Degree BE\DS Practicals Using C++"; if ($?) { g++ Exp_4.c++ -o Exp_4 }; if ($?) { . \Exp_4 }
16
14
12
PS C:\Users\Owaiz\OneDrive\Desktop\Sem 3 Degree BE\DS Practicals Using C++>

```

DATA STRUCTURE PRACTICAL NO : 05

Practical No. 5 : Implement Singly Linked List ADT..



PROGRAM

```
/*          KAZI AWAIZ SALIM          COMPUTER          DSE 22 -
23          */
// C++ program for the above approach  PRACTICAL NO 5
#include <iostream>
using namespace std;

// Node class to represent
// a node of the linked list.
class Node
{
public:
    int data;
    Node *next;

    // Default constructor
    Node()
    {
        data = 0;
        next = NULL;
    }

    // Parameterised Constructor
    Node(int data)
    {
        this->data = data;
        this->next = NULL;
    }
};

// Linked list class to
// implement a linked list.
class Linkedlist
{
    Node *head;

public:
    // Default constructor
    Linkedlist() { head = NULL; }

    // Function to insert a
    // node at the end of the
    // linked list.
    void insertNode(int);

    // Function to print the
    // linked list.
    void printList();
};
```

```
// Function to delete the
// node at given position
void deleteNode(int);
};

// Function to delete the
// node at given position
void LinkedList::deleteNode(int nodeOffset)
{
    Node *temp1 = head, *temp2 = NULL;
    int ListLen = 0;

    if (head == NULL)
    {
        cout << "List empty." << endl;
        return;
    }

    // Find length of the linked-list.
    while (temp1 != NULL)
    {
        temp1 = temp1->next;
        ListLen++;
    }

    // Check if the position to be
    // deleted is greater than the length
    // of the linked list.
    if (ListLen < nodeOffset)
    {
        cout << "Index out of range"
              << endl;
        return;
    }

    // Declare temp1
    temp1 = head;

    // Deleting the head.
    if (nodeOffset == 1)
    {
        // Update head
        head = head->next;
        delete temp1;
        return;
    }

    // Traverse the list to
    // find the node to be deleted.
    while (nodeOffset-- > 1)
```

```
{

    // Update temp2
    temp2 = temp1;

    // Update temp1
    temp1 = temp1->next;
}

// Change the next pointer
// of the previous node.
temp2->next = temp1->next;

// Delete the node
delete temp1;
}

// Function to insert a new node.
void LinkedList::insertNode(int data)
{
    // Create the new Node.
    Node *newNode = new Node(data);

    // Assign to head
    if (head == NULL)
    {
        head = newNode;
        return;
    }

    // Traverse till end of list
    Node *temp = head;
    while (temp->next != NULL)
    {

        // Update temp
        temp = temp->next;
    }

    // Insert at the last.
    temp->next = newNode;
}

// Function to print the
// nodes of the linked list.
void LinkedList::printList()
{
    Node *temp = head;

    // Check for empty list.
    if (head == NULL)
```

```
{
    cout << "List empty" << endl;
    return;
}

// Traverse the list.
while (temp != NULL)
{
    cout << temp->data << " ";
    temp = temp->next;
}
}

// Driver Code
int main()
{
    LinkedList list;

    // Inserting nodes
    list.insertNode(1);
    list.insertNode(2);
    list.insertNode(3);
    list.insertNode(4);

    cout << "Elements of the list are: ";

    // Print the list
    list.printList();
    cout << endl;

    // Delete node at position 2.
    list.deleteNode(2);

    cout << "Elements of the list are: ";
    list.printList();
    cout << endl;
    return 0;
}
```

OUTPUT of PR No : 5

```
File Edit Selection View Go Run Terminal Help
Exp_5.c++ - Sem 3 Degree BE - Visual Studio Code

EXPLORER
SEM 3 DEGREE BE
  CG Practicals
    Exp_1.c
    Exp_1.c
    Exp_1.exe
  DS Practicals Using C++
    Exp_1.c++
    Exp_1.exe
    Exp_2.c++
    Exp_2.exe
    Exp_4.c++
    Exp_4.exe
    Exp_5.c++
    Exp_5.exe

DS Practicals Using C++ > Exp_5.c++ > Node > next
1 /* KAZI AWAIZ SALIM COMPUTER DSE 22 - 23 */
2 // C++ program for the above approach PRACTICAL NO 5
3 #include <iostream>
4 using namespace std;
5
6 // Node class to represent
7 // a node of the linked list.
8 class Node
9 {
10 public:
11     int data;
12     Node *next;
13
14     // Default constructor
15     Node()
16     {
17         data = 0;
18         next = NULL;
19     }
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21 }
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DATA STRUCTURE PRACTICAL NO : 06

Practical No. 6 : Implement Binary Search Tree ADT using Linked List.

PROGRAM

```

/* KAZI AWAIZ SALIM          DATA STRUCTURE          COMPUTER          DSE 22 - 23 */
#include <stdio.h>
#include <stdlib.h>
#include <stdbool.h>

//Represent a node of binary tree
struct node{
    int data;
    struct node *left;
    struct node *right;
};

//Represent the root of binary tree
struct node *root = NULL;

//createNode() will create a new node
struct node* createNode(int data){
    //Create a new node
    struct node *newNode = (struct node*)malloc(sizeof(struct node));
    //Assign data to newNode, set left and right child to NULL
    newNode->data = data;
    newNode->left = NULL;
    newNode->right = NULL;

    return newNode;
}

//Represent a queue
struct queue
{
    int front, rear, size;
    struct node* *arr;
};

//createQueue() will create a queue
struct queue* createQueue()
{
    struct queue* newQueue = (struct queue*) malloc(sizeof( struct queue ));

    newQueue->front = -1;
    newQueue->rear = 0;
    newQueue->size = 0;

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newQueue->arr = (struct node**) malloc(100 * sizeof( struct node* ));

return newQueue;
}

//Adds a node to queue
void enqueue(struct queue* queue, struct node *temp){
    queue->arr[queue->rear++] = temp;
    queue->size++;
}

//Deletes a node from queue
struct node *dequeue(struct queue* queue){
    queue->size--;
    return queue->arr[++queue->front];
}

//insertNode() will add new node to the binary tree
void insertNode(int data) {
    //Create a new node
    struct node *newNode = createNode(data);
    //Check whether tree is empty
    if(root == NULL){
        root = newNode;
        return;
    }
    else {
        //Queue will be used to keep track of nodes of tree level-wise
        struct queue* queue = createQueue();
        //Add root to the queue
        enqueue(queue, root);

        while(true) {
            struct node *node = dequeue(queue);
            //If node has both left and right child, add both the child to queue
            if(node->left != NULL && node->right != NULL) {
                enqueue(queue, node->left);
                enqueue(queue, node->right);
            }
            else {
                //If node has no left child, make newNode as left child
                if(node->left == NULL) {
                    node->left = newNode;
                    enqueue(queue, node->left);
                }
                //If node has left child but no right child, make newNode as right child
                else {
```

```

        node->right = newNode;
        enqueue(queue, node->right);
    }
    break;
}
}
}

//inorder() will perform inorder traversal on binary search tree
void inorderTraversal(struct node *node) {
    //Check whether tree is empty
    if(root == NULL){
        printf("Tree is empty\n");
        return;
    }
    else {

        if(node->left != NULL)
            inorderTraversal(node->left);
        printf("%d ", node->data);
        if(node->right != NULL)
            inorderTraversal(node->right);

    }
}

int main(){

    //Add nodes to the binary tree
    insertNode(1);
    //1 will become root node of the tree
    printf("Binary tree after insertion: \n");
    //Binary after inserting nodes
    inorderTraversal(root);

    insertNode(2);
    insertNode(3);
    //2 will become left child and 3 will become right child of root node 1
    printf("\nBinary tree after insertion: \n");
    //Binary after inserting nodes
    inorderTraversal(root);

    insertNode(4);
    insertNode(5);
    //4 will become left child and 5 will become right child of node 2
    printf("\nBinary tree after insertion: \n");
    //Binary after inserting nodes
    inorderTraversal(root);
}

```

```

insertNode(6);
insertNode(7);
//6 will become left child and 7 will become right child of node 3
printf("\nBinary tree after insertion: \n");
//Binary after inserting nodes
inorderTraversal(root);

return 0;
}

```

OUTPUT OF PR 6

The screenshot shows a Visual Studio Code editor with a C++ file named 'Exp_6.c++'. The code implements a binary tree structure with a 'node' struct containing 'data', 'left', and 'right' pointers. It includes functions for creating a new node, inserting a new node into the tree, and performing an inorder traversal. The main function demonstrates the insertion of nodes 6 and 7 into a tree initially containing nodes 1, 2, and 3.

The terminal output shows the execution of the program, displaying the binary tree after each insertion step:

```

PS C:\Users\Owaiz\OneDrive\Desktop\Sem 3 Degree BE> cd "c:\Users\Owaiz\OneDrive\Desktop\Sem 3 Degree BE\DS Practicals Using C++\" ; if ($?) { g++ Exp_6.c++ -o Exp_6 } ; if ($?) { .\Exp_6 }
Binary tree after insertion:
1
Binary tree after insertion:
2 1 3
Binary tree after insertion:
4 2 5 1 3
Binary tree after insertion:
4 2 5 1 6 3 7
PS C:\Users\Owaiz\OneDrive\Desktop\Sem 3 Degree BE\DS Practicals Using C++>

```



DATA STRUCTURE PRACTICAL NO : 07

Practical No. 7 : Implement Graph Traversal techniques:

a) Breadth First Search b) Depth First Search

PROGRAM

a) Breadth First Search

```

/* KAZI AWAIZ SALIM      DATA STRUCTURE      COMPUTER      DSE 22 - 23 */
// Program to print BFS traversal from a given
// source vertex. BFS(int s) traverses vertices
// reachable from s.
#include <bits/stdc++.h>
using namespace std;

// This class represents a directed graph using
// adjacency list representation
class Graph
{
    int V; // No. of vertices

    // Pointer to an array containing adjacency
    // lists
    vector<list<int>>> adj;

public:
    Graph(int V); // Constructor

    // function to add an edge to graph
    void addEdge(int v, int w);

    // prints BFS traversal from a given source s
    void BFS(int s);
};

Graph::Graph(int V)
{
    this->V = V;
    adj.resize(V);
}

void Graph::addEdge(int v, int w)
{
    adj[v].push_back(w); // Add w to v's list.
}

void Graph::BFS(int s)
{
    // Mark all the vertices as not visited

```

```

vector<bool> visited;
visited.resize(V, false);

// Create a queue for BFS
list<int> queue;

// Mark the current node as visited and enqueue it
visited[s] = true;
queue.push_back(s);

while (!queue.empty())
{
    // Dequeue a vertex from queue and print it
    s = queue.front();
    cout << s << " ";
    queue.pop_front();

    // Get all adjacent vertices of the dequeued
    // vertex s. If a adjacent has not been visited,
    // then mark it visited and enqueue it
    for (auto adjacent : adj[s])
    {
        if (!visited[adjacent])
        {
            visited[adjacent] = true;
            queue.push_back(adjacent);
        }
    }
}

// Driver program to test methods of graph class
int main()
{
    // Create a graph given in the above diagram
    Graph g(4);
    g.addEdge(0, 1);
    g.addEdge(0, 2);
    g.addEdge(1, 2);
    g.addEdge(2, 0);
    g.addEdge(2, 3);
    g.addEdge(3, 3);

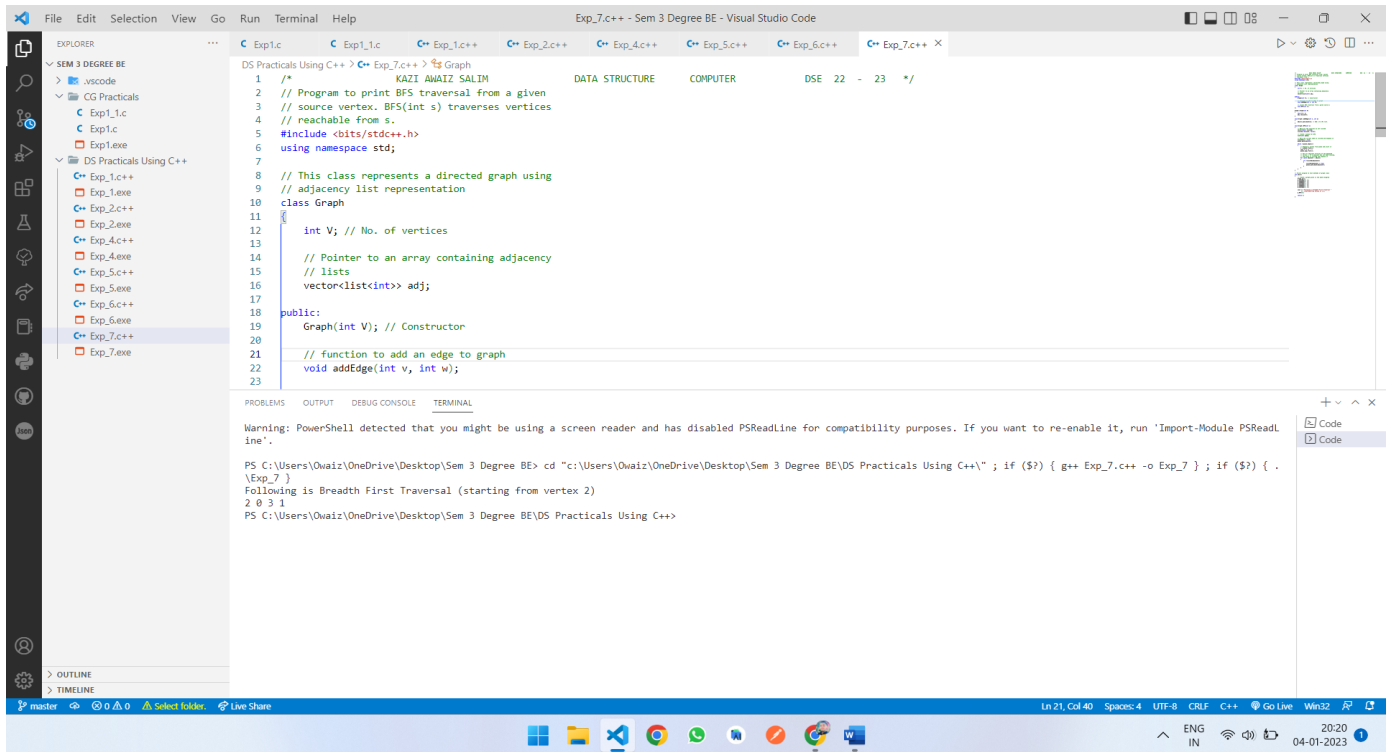
    cout << "Following is Breadth First Traversal "
         << "(starting from vertex 2) \n";
    g.BFS(2);

    return 0;
}

```

OUTPUT OF PR 7

A)



B) Depth First Search

```

/* KAZI AWAIZ SALIM DATA STRUCTURE COMPUTER DSE 22 - 23 */
// C++ program to print DFS traversal from
// a given vertex in a given graph
#include <bits/stdc++.h>
using namespace std;

// Graph class represents a directed graph
// using adjacency list representation
class Graph
{
public:
    map<int, bool> visited;
    map<int, list<int>> adj;

    // function to add an edge to graph
    void addEdge(int v, int w);

    // DFS traversal of the vertices

```

```
// reachable from v
void DFS(int v);
};

void Graph::addEdge(int v, int w)
{
    adj[v].push_back(w); // Add w to v's list.
}

void Graph::DFS(int v)
{
    // Mark the current node as visited and
    // print it
    visited[v] = true;
    cout << v << " ";

    // Recur for all the vertices adjacent
    // to this vertex
    list<int>::iterator i;
    for (i = adj[v].begin(); i != adj[v].end(); ++i)
        if (!visited[*i])
            DFS(*i);
}

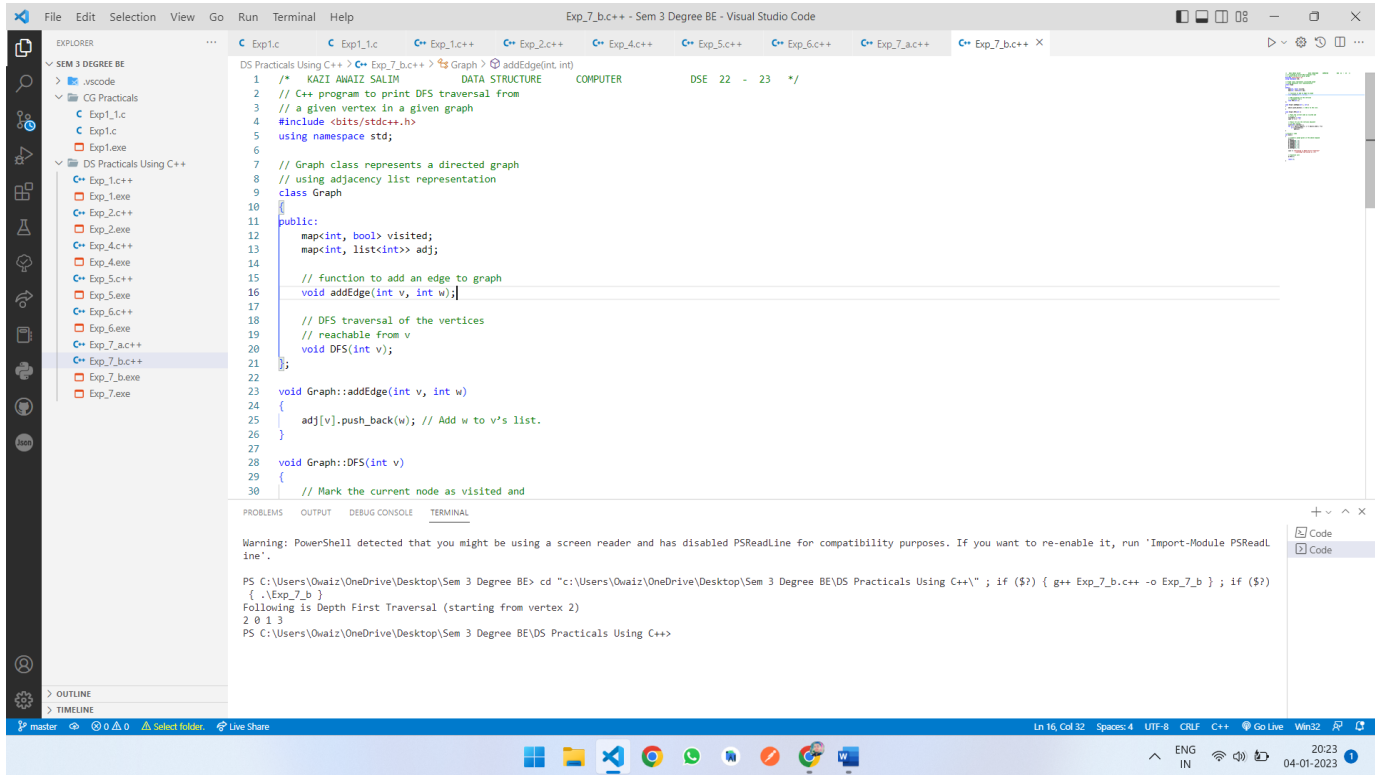
// Driver's code
int main()
{
    // Create a graph given in the above diagram
    Graph g;
    g.addEdge(0, 1);
    g.addEdge(0, 2);
    g.addEdge(1, 2);
    g.addEdge(2, 0);
    g.addEdge(2, 3);
    g.addEdge(3, 3);

    cout << "Following is Depth First Traversal"
         << " (starting from vertex 2) \n";

    // Function call
    g.DFS(2);

    return 0;
}
```

OUTPUT OF PR 7 B)



The screenshot displays the Visual Studio Code interface with a C++ project named "Exp_7_b.c++ - Sem 3 Degree BE". The Explorer panel on the left shows the project structure, including files for "SEM 3 DEGREE BE", "CG Practicals", and "DS Practicals Using C++". The main editor shows the source code for "Exp_7_b.c++", which implements a Depth First Search (DFS) algorithm on a directed graph. The code includes a header for `<bits/stdc++.h>`, uses the `std` namespace, and defines a `Graph` class with methods for adding edges and performing DFS. The `DFS` method uses a recursive approach to traverse the graph starting from vertex 2.

```
1 /* KAZI AWAIZ SALIM DATA STRUCTURE COMPUTER DSE 22 - 23 */
2 // C++ program to print DFS traversal from
3 // a given vertex in a given graph
4 #include <bits/stdc++.h>
5 using namespace std;
6
7 // Graph class represents a directed graph
8 // using adjacency list representation
9 class Graph
10 {
11 public:
12     map<int, bool> visited;
13     map<int, list<int>> adj;
14
15     // Function to add an edge to graph
16     void addEdge(int v, int w);
17
18     // DFS traversal of the vertices
19     // reachable from v
20     void DFS(int v);
21 };
22
23 void Graph::addEdge(int v, int w)
24 {
25     adj[v].push_back(w); // Add w to v's list.
26 }
27
28 void Graph::DFS(int v)
29 {
30     // Mark the current node as visited and
```

The Output panel at the bottom shows the execution results of the program. It includes a warning from PowerShell about PSReadLine and the output of the DFS traversal starting from vertex 2, which is "2 0 1 3".

```
Warning: PowerShell detected that you might be using a screen reader and has disabled PSReadLine for compatibility purposes. If you want to re-enable it, run 'Import-Module PSReadLine'.
PS C:\Users\Owaiz\OneDrive\Desktop\Sem 3 Degree BE\DS Practicals Using C++> cd "c:\Users\Owaiz\OneDrive\Desktop\Sem 3 Degree BE\DS Practicals Using C++"; if ($?) { g++ Exp_7_b.c++ -o Exp_7_b }; if ($?) { .\Exp_7_b }
Following is Depth First Traversal (starting from vertex 2)
2 0 1 3
PS C:\Users\Owaiz\OneDrive\Desktop\Sem 3 Degree BE\DS Practicals Using C++>
```