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Section – 620-B

Domain Winter Winning Camp

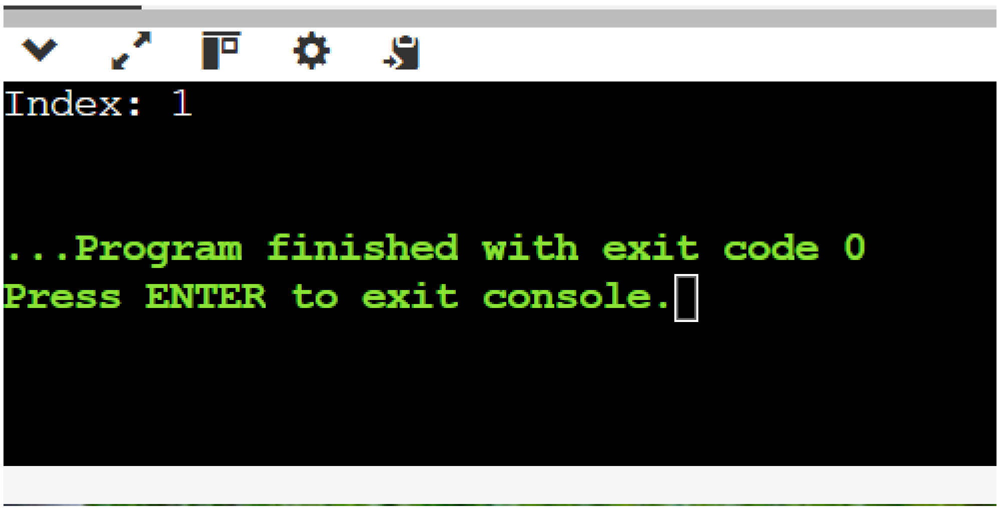
Q1. Given a string find the first non repeating character and return their index value if it does not exist than return -1.

Ans

```
#include <iostream>
#include <string>
#include <vector>
using namespace std;
int firstNonRepeatingCharacter(const string& s) {
    vector<int> charCount(256, 0);
    for (char c : s) {
        charCount[c]++;
    }
    for (int i = 0; i < s.length(); ++i) {
        if (charCount[s[i]] == 1) {
            return i;
        }
    }
    return -1;
}
int main() {
    string s = "avacado";
    int index = firstNonRepeatingCharacter(s);
    cout << "Index: " << (index != -1 ? to_string(index) : "No non-repeating character") << endl;
    return 0;
```

}

Output



```
Index: 1


...Program finished with exit code 0
Press ENTER to exit console.
```

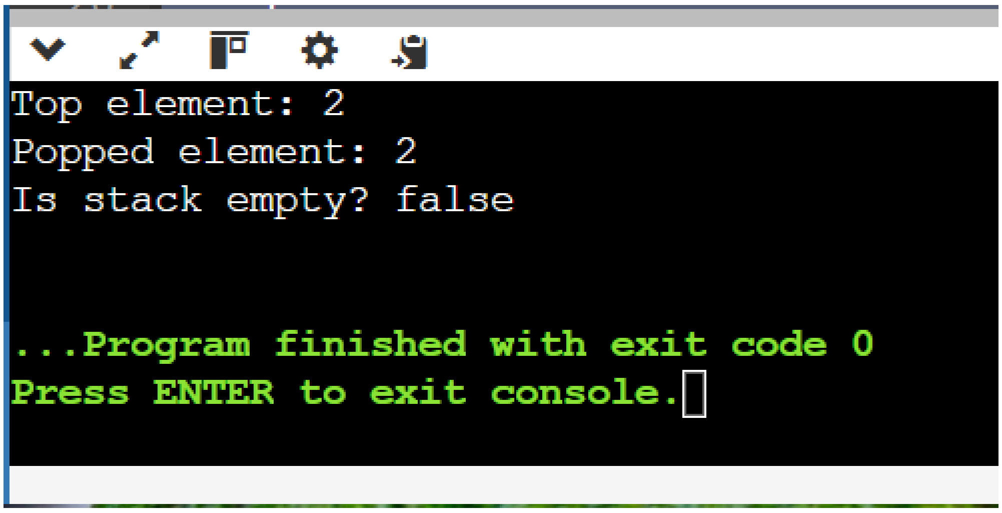
Q2.Implementation of 2 queue

Ans

```
#include <iostream>

#include <queue>

using namespace std;

class StackUsingQueues {

private:

    queue<int> queue1, queue2;


public:

    void push(int x) {

        queue1.push(x);

    }


    int pop() {

        while (queue1.size() > 1) {
            queue2.push(queue1.front());
            queue1.pop();
        }
        int popped_element = queue1.front();
        queue1.pop();
        swap(queue1, queue2);
        return popped_element;
    }

    int top() {
        return queue1.back();
    }

    bool empty() {
        return queue1.empty();
    }
};

int main() {
    StackUsingQueues stack;
    stack.push(1);
    stack.push(2);
    cout << "Top element: " << stack.top() << std::endl;
    cout << "Popped element: " << stack.pop() << std::endl;
    cout << "Is stack empty? " << std::boolalpha << stack.empty() << std::endl;
//false
    return 0;
```

}

Output



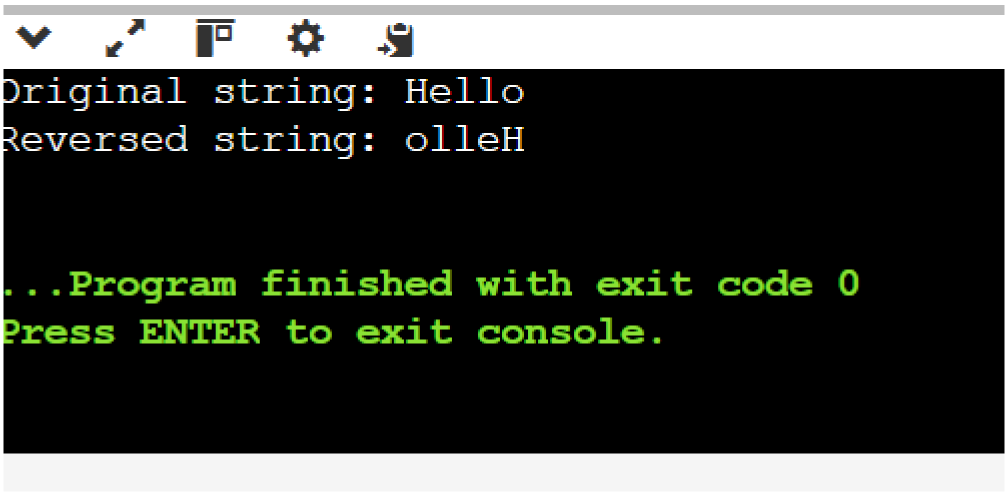
```
Top element: 2
Popped element: 2
Is stack empty? false


...Program finished with exit code 0
Press ENTER to exit console.
```

Q3. Reversal of a string

Ans

```
#include <iostream>

#include <stack>

#include <string>

using namespace std;

string reverseStringUsingStack(const string& input) {

    stack<char> charStack;

    for (char ch : input) {

        charStack.push(ch);

    }


    string reversed;

    while (!charStack.empty()) {

        reversed += charStack.top();

        charStack.pop();

    }

    return reversed;
}
int main() {
    string input = "Hello";
    string reversed = reverseStringUsingStack(input);

    cout << "Original string: " << input << endl;
    cout << "Reversed string: " << reversed <<endl;

    return 0;
}
```

Output



```
Original string: Hello
Reversed string: olleH


...Program finished with exit code 0
Press ENTER to exit console.
```

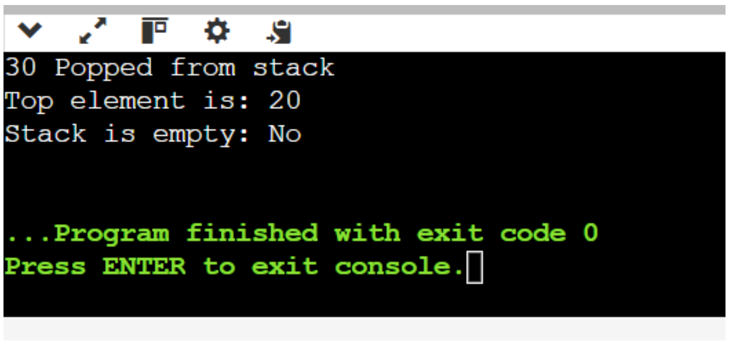
Q4. Implementation of stack using array and linked list

Ans

```
#include <iostream>
using namespace std;

class Stack {
private:
    int top;
    int arr[1000];
```

```
public:
    Stack() { top = -1; }

    void push(int x) {
        if (top >= 999) {
            cout << "Stack Overflow" << endl;
            return;
        }
        arr[++top] = x;
    }

    int pop() {
        if (top < 0) {
            cout << "Stack Underflow" << endl;
            return -1;
        }
        return arr[top--];
    }

    int peek() {
        if (top < 0) {
            cout << "Stack is Empty" << endl;
            return -1;
        }
        return arr[top];
    }

    bool isEmpty() {
        return (top < 0);
    }
};

int main() {
    Stack s;
    s.push(10);
    s.push(20);
    s.push(30);
    cout << s.pop() << " Popped from stack\n";
    cout << "Top element is: " << s.peek() << endl;
    cout << "Stack is empty: " << (s.isEmpty() ? "Yes" : "No") << endl;
    return 0;
}
```

Output



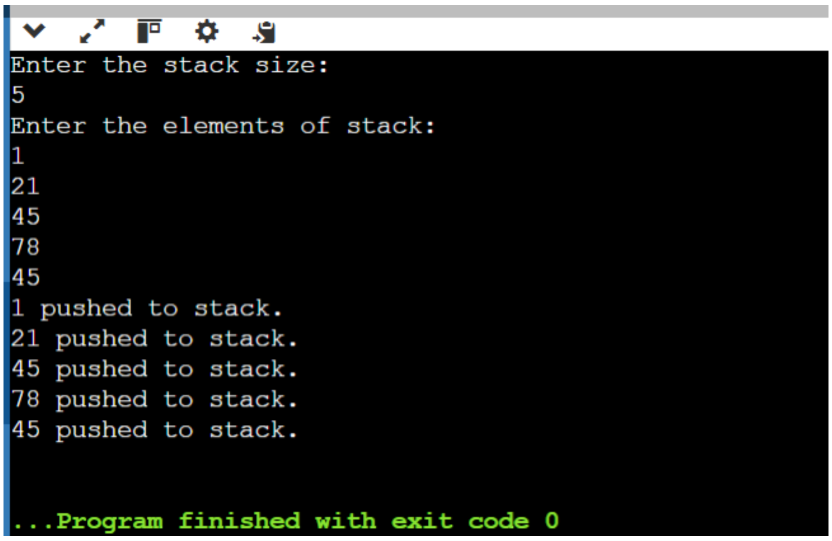
```
30 Popped from stack
Top element is: 20
Stack is empty: No


...Program finished with exit code 0
Press ENTER to exit console.
```

Q5. Implementation of stack by using array only push operation

Ans

```
#include <iostream>
using namespace std;
class Stack {
private:
    int* arr;
    int capacity;
    int top;
public:
    Stack(int size) {
        capacity = size;
        arr = new int[capacity];
        top = -1;
    }
    void push(int value) {
        if (top >= capacity - 1) {
            cout << "Stack overflow! Cannot push " << value << endl;
        } else {
            arr[++top] = value;
            cout << value << " pushed to stack." << endl;
        }
    }
};
int main() {
    int stackSize;
    cout<<"Enter the stack size:"<<endl;
    cin>>stackSize;
    Stack myStack(stackSize);
    int arr[stackSize];
    cout<<"Enter the elements of stack:"<<endl;
    for(int i=0;i<stackSize;i++)
    {
        cin>>arr[i];
    }
    for(int i=0;i<stackSize;i++)
    {
        myStack.push(arr[i]);
    }
    return 0;
}
```

Output

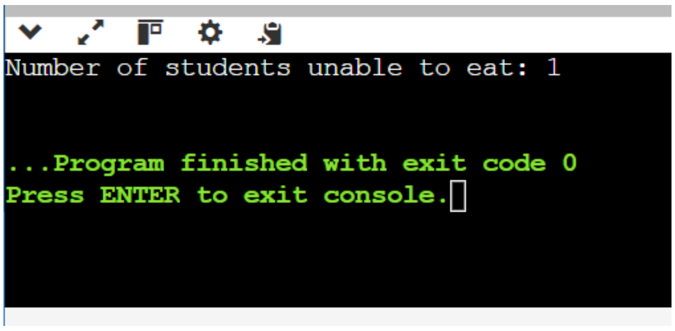


```
Enter the stack size:
5
Enter the elements of stack:
1
21
45
78
45
1 pushed to stack.
21 pushed to stack.
45 pushed to stack.
78 pushed to stack.
45 pushed to stack.


...Program finished with exit code 0
```

Q6. The school cafeteria offers circular and square sandwiches at lunch break, referred to by numbers 0 and 1 respectively. All students stand in a queue. Each student either prefers square or circular sandwiches.

Ans

```
#include <iostream>
#include <queue>
#include <vector>
using namespace std;

int countStudents(vector<int>& students, vector<int>& sandwiches) {
    queue<int> studentQueue;
    for (int student : students) {
        studentQueue.push(student);
    }

    int sandwichIndex = 0;
    int attempts = 0;

    while (!studentQueue.empty() && attempts < studentQueue.size()) {
        if (studentQueue.front() == sandwiches[sandwichIndex]) {
            studentQueue.pop();
            sandwichIndex++;
            attempts = 0;
        } else {
            studentQueue.push(studentQueue.front());
            studentQueue.pop();
            attempts++;
        }
    }

    return studentQueue.size();
}

int main() {
    vector<int> students = {1, 1, 0, 0};
    vector<int> sandwiches = {0, 1, 1, 1};
    cout << "Number of students unable to eat: " << countStudents(students, sandwiches) <<
endl;
    return 0;
} Output
```



```
Number of students unable to eat: 1


...Program finished with exit code 0
Press ENTER to exit console.
```

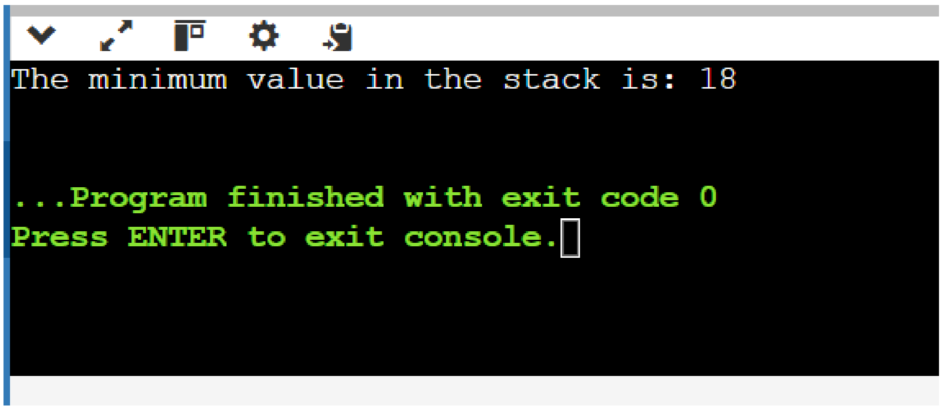
Q7. Check the minimum value in stack.

Value are {18,19,29,16,15} output {18}

Ans

```
#include <iostream>

#include <stack>

using namespace std;

int main() {

    stack<int> s;

    s.push(18);

    s.push(19);

    s.push(29);

    s.push(16);

    s.push(15);


    stack<int> tempStack;

    int minVal=18;

    while (!s.empty()) {

        int x=s.top();

        s.pop();

        if(x<=minVal){

            x=minVal;

        }

    }
    cout << "The minimum value in the stack is: " << minVal << endl;

    return 0;

}
```

Output



```
The minimum value in the stack is: 18


...Program finished with exit code 0
Press ENTER to exit console.
```

Q8. Given a queue, write a recursive function to reverse it.

Standard operations allowed :

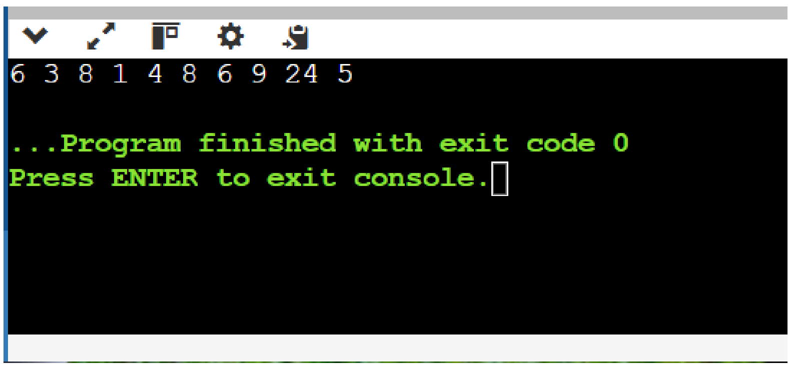
enqueue(x) : Add an item x to rear of queue.
dequeue() : Remove an item from front of queue.
empty() : Checks if a queue is empty or not.

Ans

```
#include <iostream>

#include <queue>

using namespace std;

void reverseQueue(queue<int>& q) {

    if (q.empty()) {

        return;

    }

    int front = q.front();

    q.pop();

    reverseQueue(q);

    q.push(front);

}
```

```
int main() {
    queue<int> q;
    q.push(5);
    q.push(24);
    q.push(9);
    q.push(6);
    q.push(8);
    q.push(4);
    q.push(1);
    q.push(8);
    q.push(3);
    q.push(6);
    reverseQueue(q);
    while (!q.empty()) {
        cout << q.front() << " ";
        q.pop();
    }

    return 0;
}
```

Output



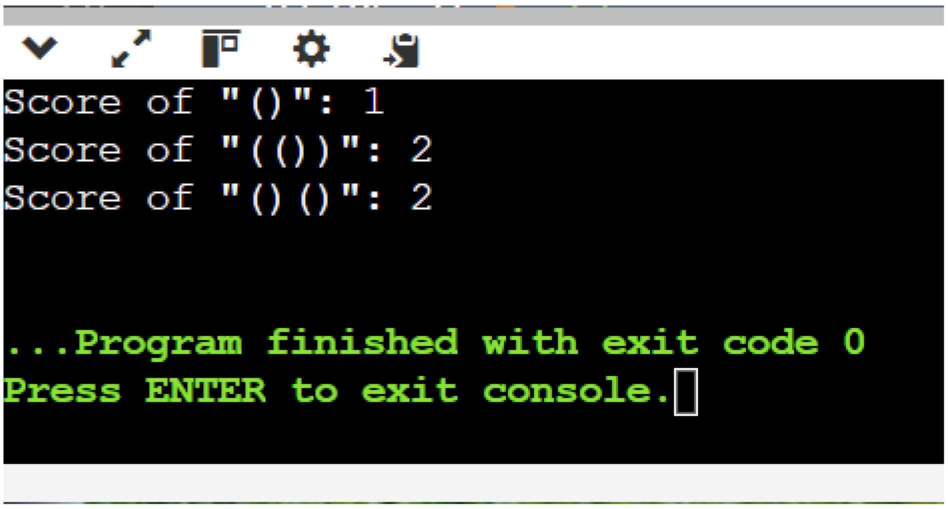
```
6 3 8 1 4 8 6 9 24 5

...Program finished with exit code 0
Press ENTER to exit console.
```

Q9. Given a balanced parentheses string s, return the score of the string.

Ans

```
#include <iostream>
#include <stack>
#include <string>
using namespace std;

int scoreOfParentheses(string s) {
    stack<int> st;
    st.push(0);

    for (char c : s) {
        if (c == '(') {
            st.push(0);
        } else {
            int v = st.top();
            st.pop();
            int w = st.top();
            st.pop();
            st.push(w + max(2 * v, 1));
        }
    }

    return st.top();
}

int main() {
    string s1 = "()";
    string s2 = "(())";
    string s3 = "()()";
    cout << "Score of \"" << s1 << "\": " << scoreOfParentheses(s1) << endl;
    cout << "Score of \"" << s2 << "\": " << scoreOfParentheses(s2) << endl;
    cout << "Score of \"" << s3 << "\": " << scoreOfParentheses(s3) << endl;

    return 0;
}
```

Output



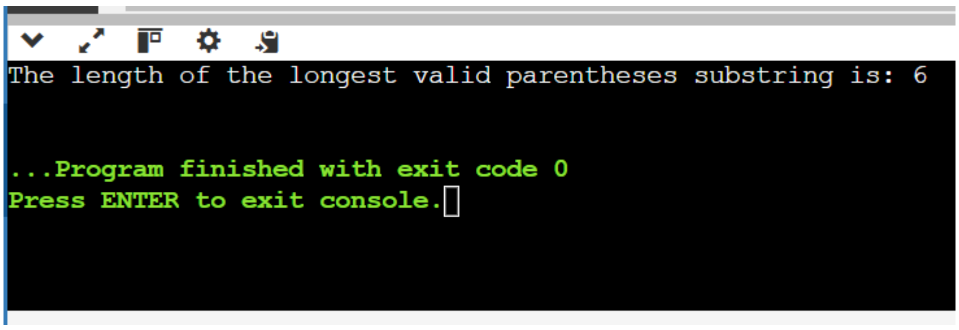
```
Score of "()": 1
Score of "(())": 2
Score of "()()": 2


...Program finished with exit code 0
Press ENTER to exit console.
```

Q10. Given a string containing just the characters '(' and ')', return the length of the longest valid (well-formed) parentheses substring.

Ans

```
#include <iostream>
#include <stack>
#include <string>
using namespace std;

int longestValidParentheses(string s) {
    stack<int> st;
    st.push(-1); // Initial base for calculating valid lengths
    int maxLength = 0;
    for (int i = 0; i < s.length(); ++i) {
        if (s[i] == '(') {
            st.push(i);
        } else {
            st.pop();
            if (st.empty()) {
                st.push(i);
            } else {
                maxLength = max(maxLength, i - st.top());
            }
        }
    }

    return maxLength;
}

int main() {
    string s = "(()";
    cout << "The length of the longest valid parentheses substring is: " <<
longestValidParentheses(s) << endl; // Output: 2
    return 0;
}
```

Output



```
The length of the longest valid parentheses substring is: 6


...Program finished with exit code 0
Press ENTER to exit console.
```