Name – Rohan kumar

UID – 22BCS15402

Section – 620-B

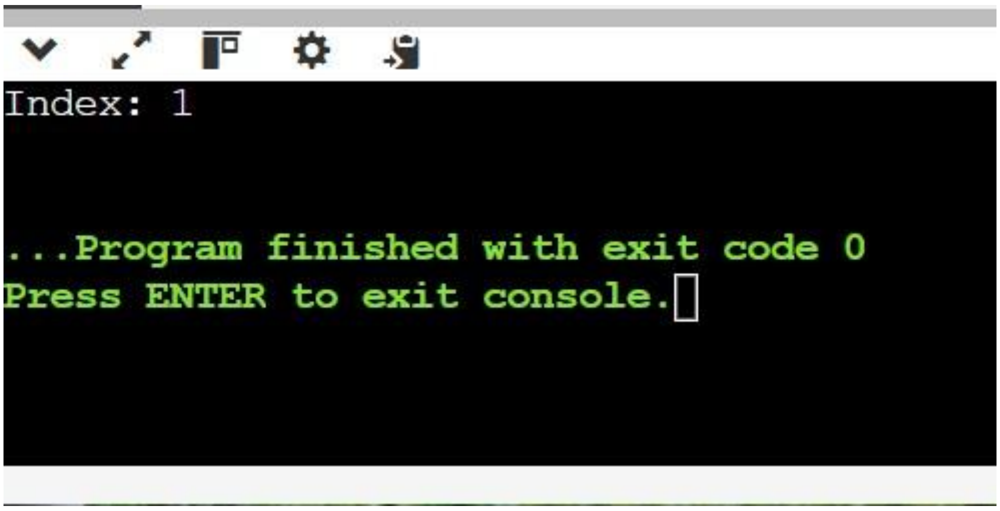
Domain Winter Winning Camp

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 = "Hello";     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.
```

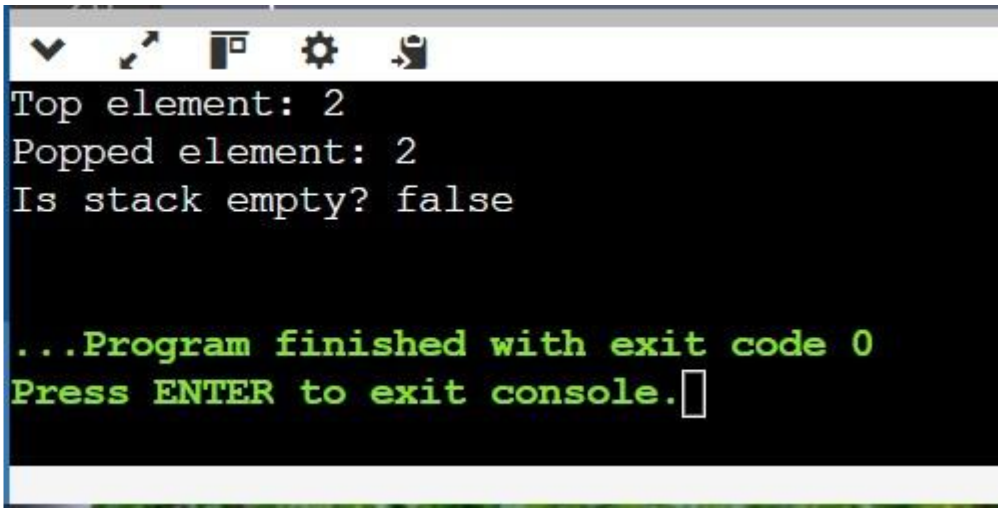
Q2.Implementation of 2 queue

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.
```

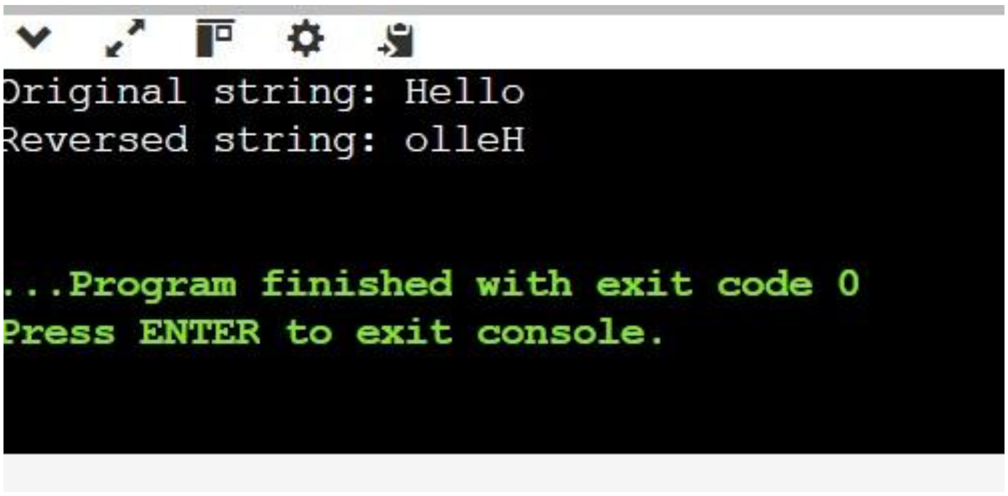
Q3. Reversal of a string

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

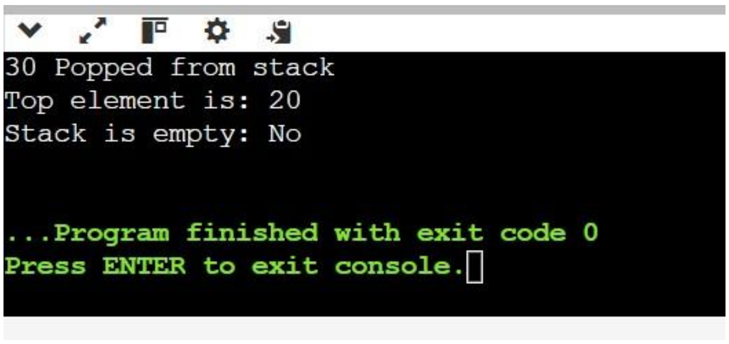
Ans

```
#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.
```

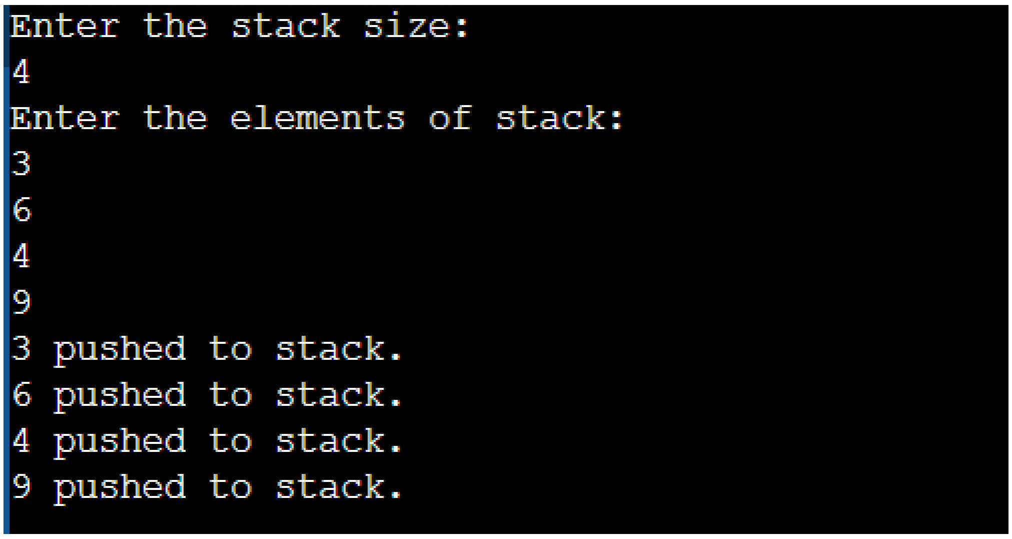
Q5. Implementation of stack by using array only push operation

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

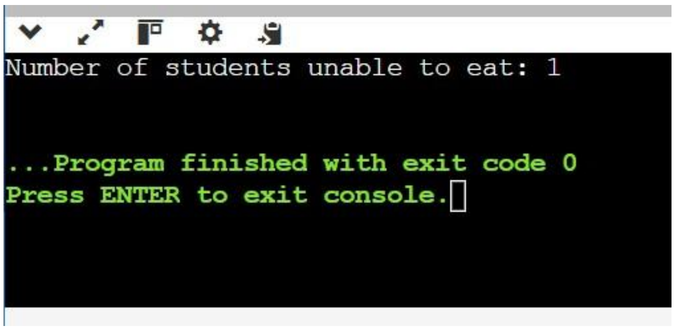

```
Enter the stack size:
4
Enter the elements of stack:
3
6
4
9
3 pushed to stack.
6 pushed to stack.
4 pushed to stack.
9 pushed to stack.
```

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.
```

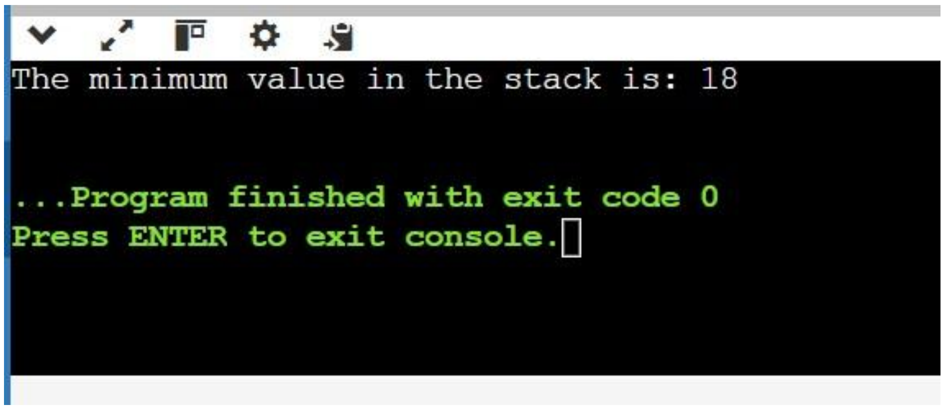
Q7. Check the minimum value in stack.

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.

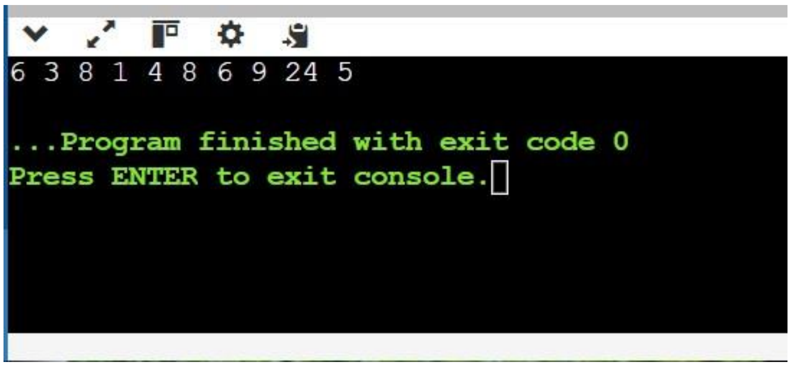
Standard operations allowed :

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.
```

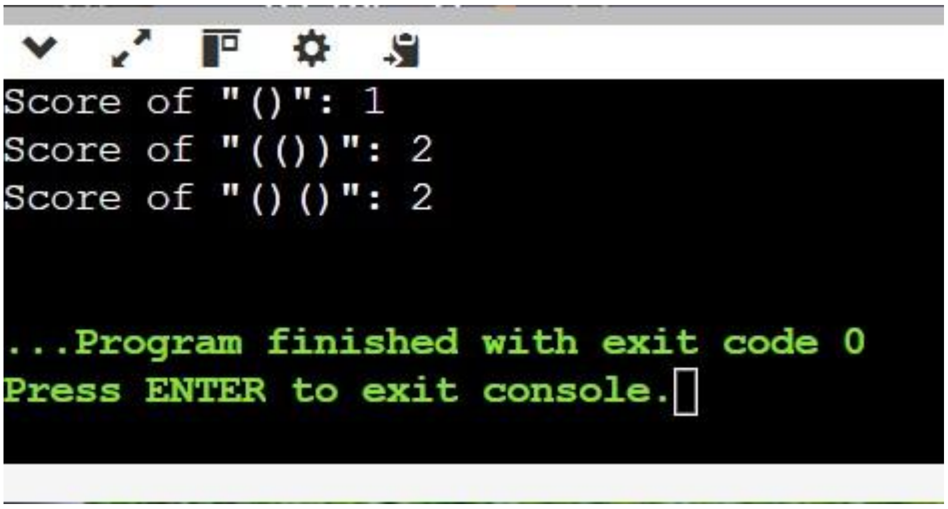
Q9. Given a balanced parentheses string s, return the score of the string.

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 << "\": "
<<
scoreOfParenthes
es(s1) << endl;
cout << "Score of
\"" << s2 << "\": "
<<
scoreOfParenthes
es(s2) << endl;
cout << "Score of
\"" << s3 << "\": "
<<
scoreOfParenthes
es(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.
```

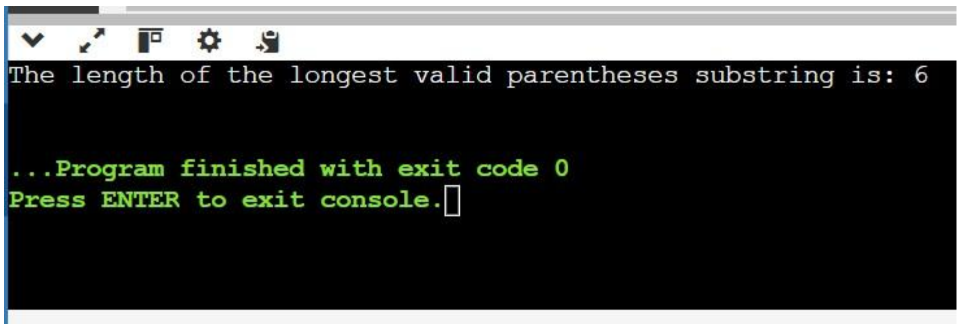
Q10. Given a string containing just the characters '(' and ')', return the length of the longest valid (well-formed) parentheses substring**.**

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.
```