KALINGA INSTITUTE OF INDUSTRIAL TECHNOLOGY (KIIT)

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LAB 10-Template

- Name :HITU RAJ
- Roll no. :2005025
- Branch :CSE


```
    /* Q1) (Function Template) Define a function template for finding
 the minimum value contained in an array.
  Write main() function to find the minimum value of integer array
   and minimum value of floating point numbers in an array.*/

#include <bits/stdc++.h>
using namespace std;
template <class T_025>
void min_025(T_025 arr_025[], int n_025)
{
    T_025 min_element_025 = arr_025[0];
    for (int i_025 = 1; i_025 < n_025; i_025++)
    {
```

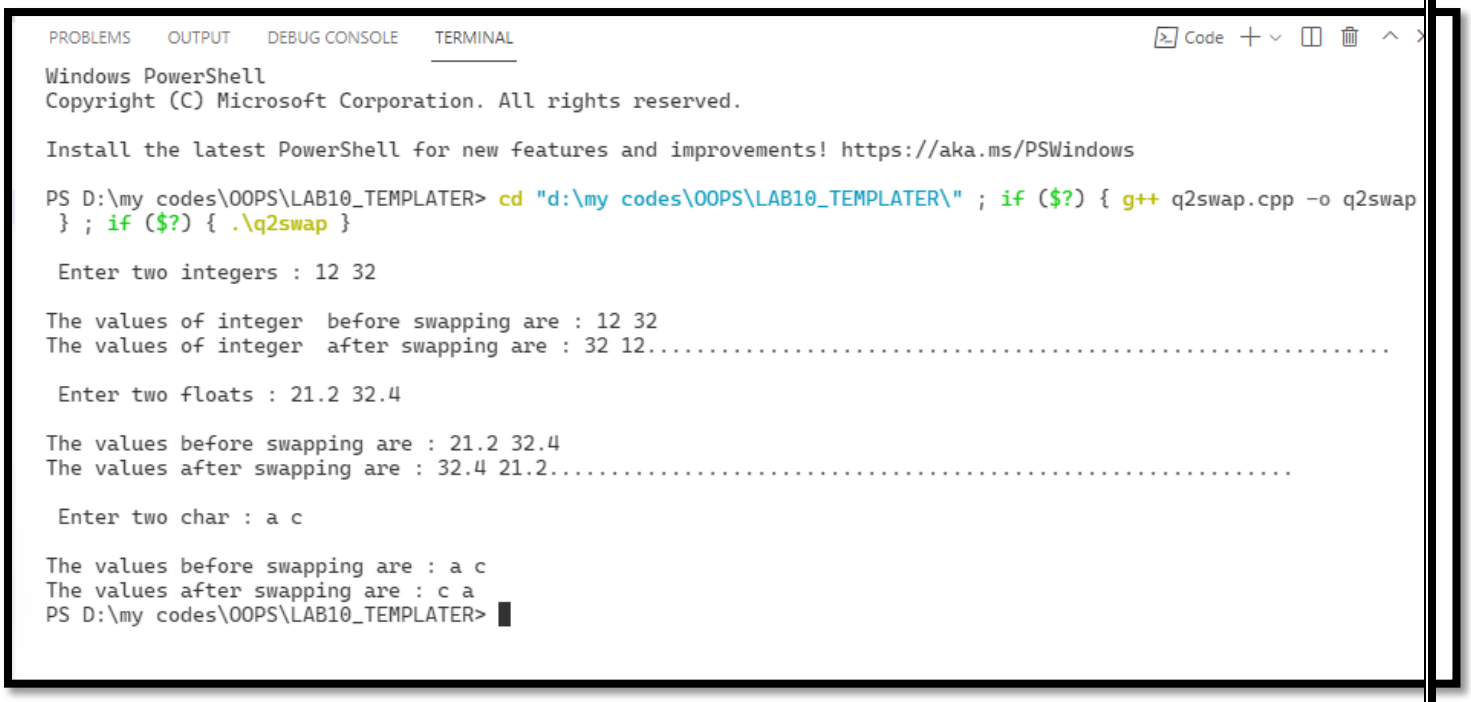
```
        if (arr_025[i_025] < min_element_025)
        {
            min_element_025 = arr_025[i_025];
        }
    }
    cout << "Minimum Element is: " << min_element_025 << endl;
}
int main()
{
    int n_025;
    cout << "Enter the size of the Integer array: ";
    cin >> n_025;
    int arr_025[n_025];
    cout << "Enter the elements of the Integer array: ";
    for (int i_025 = 0; i_025 < n_025; i_025++)
    {
        cin >> arr_025[i_025];
    }
    min_025(arr_025, n_025);
    cout << "Enter the size of the Floating array:";
    cin >> n_025;
    float arr1_025[n_025];
    cout << "Enter the elements of the Floating array: ";
    for (int i_025 = 0; i_025 < n_025; i_025++)
    {
        cin >> arr1_025[i_025];
    }
    min_025(arr1_025, n_025);
    return 0;
}
```

OUTPUT-1


```cpp
// q2.Write a program to define the function template for
// swapping the two items of various data types such as integers,
float and
// characters etc.
#include <iostream>
using namespace std;
template <class T>

void swapping(T &x, T &y)

{

    T temp = x;
    x = y;
    y = temp;
}

int main()

{

    float p, q;

    int m, n;
```

```
    char a, b;

    cout << "\n Enter two integers : ";

    cin >> m >> n;

    cout << "\nThe values of integer  before swapping are : " << m
<< " " << n;

    swapping(m, n);

    cout << "\nThe values of integer  after swapping are : " << m <<
" " << n;
    cout <<
".....................................................\n";
     cout << "\n Enter two floats : ";

    cin >> p >> q;

    cout << "\nThe values before swapping are : " << p << " " << q;

    swapping(p, q);

    cout << "\nThe values after swapping are : " << p << " " << q;

    cout <<
".....................................................\n";
     cout << "\n Enter two char : ";

    cin >> a >> b;

    cout << "\nThe values before swapping are : " << a << " " << b;

    swapping(a, b);

    cout << "\nThe values after swapping are : " << a << " " << b;

    return 0;
}
```

OUTPUT-2




```
/*q3.Write a template function to search for a given key
element from an array. Illustrate how you perform search in integer,
character as well as double arrays using the same template
function.*/
#include <iostream>
using namespace std;
template <class T>

void search(T a[], int x, T y)

{
    int count = 0;
    for (int i = 0; i < x; i++)
    {
        if (a[i] == y)
        {

            count++;
        }
    }
    if (count > 0)
    {
        cout << "element found";
    }
    else
    {
```

```
        cout << "element not found";
    }
}

int main()

{

    float p[100], q;

    int m[100], n;
    char a[100], b;



    cout << "\n Enter the 5 value in int array : ";
    for (int i = 0; i < 5; i++)
    {
        cin >> m[i];
    }
    cout << "enter element u want to search";
    cin >> n;
    search(m, 5, n);
    cout << ".....\n";

    cout << "\n Enter the 5 value in char array : ";
    for (int i = 0; i < 5; i++)
    {
        cin >> a[i];
    }
    cout << "enter element u want to search";
    cin >> b;
    search(a, 5, b);

    cout << ".....\n";

    cout << "\n Enter the 5 value in flaot array : ";
    for (int i = 0; i < 5; i++)
    {
        cin >> p[i];
    }
    cout << "enter element u want to search";
    cin >> q;
```

```
    search(p, 5, q);

    return 0;
}
```

OUTPUT-3

```
PROBLEMS  OUTPUT  DEBUG CONSOLE  TERMINAL                                  Code

Windows PowerShell
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PS D:\my codes\OOPS\LAB10_TEMPLATER> cd "d:\my codes\OOPS\LAB10_TEMPLATER\" ; if ($?) { g++ q3_search.cpp -o q3_
search } ; if ($?) { .\q3_search }

 Enter the 5 value in int array : 32 43 212 32 213
enter element u want to search23
element not found.....................................

 Enter the 5 value in char array : a c w f q d
enter element u want to searchelement not found.....................................

 Enter the 5 value in flaot array : 23.231 21 221.0 12.32 21
enter element u want to search21
element found
PS D:\my codes\OOPS\LAB10_TEMPLATER>
```

```
//Q4) (Non-type as function parameters) Write a program to
demonstrate
//the concept behind function templates with non-type
//as function parameters by taking sorting an array of numbers
//as an example.

#include <bits/stdc++.h>
using namespace std;
template <class T_025>
void sort(T_025 *ar_025, int n_025)
{
    int i_025, j_025;
    T_025 temp_025;
    for (i_025 = 0; i_025 < n_025; i_025++)
    {
        for (j_025 = i_025 + 1; j_025 < n_025; j_025++)
```

```
        {
            if (ar_025[i_025] > ar_025[j_025])
            {
                temp_025 = ar_025[i_025];
                ar_025[i_025] = ar_025[j_025];
                ar_025[j_025] = temp_025;
            }
        }
    }
}
int main()
{
    int n_025;
    cout << "Enter the size of the Array:";
    cin >> n_025;
    int ar_025[n_025];
    cout << "Enter the elements of the Array: ";
    for (int i_025 = 0; i_025 < n_025; i_025++)
    {
        cin >> ar_025[i_025];
    }
    sort(ar_025, n_025);
    cout << "Sorted Array: ";
    for (int i_025 = 0; i_025 < n_025; i_025++)
    {
        cout << ar_025[i_025] << " ";
    }
    return 0;
```

OUTPUT-4

```cpp
/*Q5) (Class Template) Write a program to define a class template
for reading two
data items from the keyboard and find out their sum.*/

#include <iostream>
using namespace std;

template <class T>
class add
{
    int a, b;

public:
    T sum(T x, T y)
    {
        return x+y;
    }
};

    void SUM(int m,int n=50)
{

    m=m+n;
    n=m-n;
    cout<<m<<" "<<n;
}
int main()
{
SUM(50,10);
    /* add<int>a;
      add<float>b;
   cout<<"sum of int is "<< a.sum(2,3)<<endl;
   cout<<"sum of float no. are "<< b.sum(2.1,3.1);*/

    return 0;
}
```

OUTPUT-5


```cpp
// Q6) (Class Template) Write a class template to represent a generic
// vector.

#include <bits/stdc++.h>
using namespace std;
template <class T_025>
class vector_025
{
private:
    T_025 *arr_025;
    int n_025;

public:
    vector_025(int size_025)
    {
        n_025 = size_025;
        arr_025 = new T_025[n_025];
    }
    void get_data_025()
    {
        cout << "Enter the elements of the vector: ";
        for (int i_025 = 0; i_025 < n_025; i_025++)
        {
            cin >> arr_025[i_025];
        }
    }
    void modify_data_025(T_025 new_val_025, int index_025)
    {
        arr_025[index_025] = new_val_025;
```

```
    }
    void multiply_data_025(T_025 new_val_025)
    {
        for (int i_025 = 0; i_025 < n_025; i_025++)
        {
            arr_025[i_025] *= new_val_025;
        }
    }
    void display_025()
    {
        cout << "The elements of the vector are: ";
        for (int i_025 = 0; i_025 < n_025; i_025++)
        {
            cout << arr_025[i_025] << " ";
        }
        cout << endl;
    }
};
int main()
{
    int n_025;
    cout << "Enter the size of the vector: ";
    cin >> n_025;
    vector_025<int> v_025(n_025);
    v_025.get_data_025();
    v_025.display_025();
    int index_025;
    cout << "Enter the index of the element to be modified: ";
    cin >> index_025;
    int new_val_025;
    cout << "Enter the new value: ";
    cin >> new_val_025;
    v_025.modify_data_025(new_val_025, index_025);
    v_025.display_025();
    int multiply_val_025;
    cout << "Enter the value to be multiplied: ";
    cin >> multiply_val_025;
    v_025.multiply_data_025(multiply_val_025);
    v_025.display_025();
    return 0;
}
```

OUTPUT-6


```
/*Q7) (Class Template) Write a program to explain class template
by creating a template T for a class named pair having two data
 members of type T which are inputted by a constructor and a member
  function get-max() return the greatest of two numbers to main.
  Note: the value of T depends upon the data type specified during
   object creation.*/

#include <bits/stdc++.h>
using namespace std;
template <class T_025>
class pair_025
{
private:
    T_025 a_025, b_025;

public:
    pair_025(T_025 x_025, T_025 y_025)
    {
        a_025 = x_025;
        b_025 = y_025;
    }
    T_025 greater_025()
    {
        if (a_025 > b_025)
```

```
            return a_025;
        else
            return b_025;
    }
};
int main()
{
    pair_025<int> p_025(10, 25);
    cout << p_025.greater_025() << endl;
    return 0;
```

OUTPUT-7


```
//Q8) Matrix Implementation using Template Class. Overload Addition
//Operator.

#include <bits/stdc++.h>
 using namespace std;
template <class T_025>
class matrix_025
{
private:
    int r_025, c_025;
    T_025 **arr_025;

public:
    matrix_025(int row_025, int col_025)
    {
        r_025 = row_025;
```

```
        c_025 = col_025;
        arr_025 = new T_025 *[r_025];
        for (int i_025 = 0; i_025 < r_025; i_025++)
        {
            arr_025[i_025] = new T_025[c_025];
        }
    }
    void get_data_025()
    {
        cout << "Enter the elements of the matrix: \n";
        for (int i_025 = 0; i_025 < r_025; i_025++)
        {
            for (int j_025 = 0; j_025 < c_025; j_025++)
            {
                cin >> arr_025[i_025][j_025];
            }
        }
    }
    matrix_025<T_025> operator+(matrix_025<T_025> m_025)
    {
        matrix_025<T_025> temp_025(r_025, c_025);
        for (int i_025 = 0; i_025 < r_025; i_025++)
        {
            for (int j_025 = 0; j_025 < c_025; j_025++)
            {
                temp_025.arr_025[i_025][j_025] =
arr_025[i_025][j_025] + m_025.arr_025[i_025][j_025];
            }
        }
        return temp_025;
    }
    void display_025()
    {
        cout << "The matrix is: " << endl;
        for (int i_025 = 0; i_025 < r_025; i_025++)
        {
            for (int j_025 = 0; j_025 < c_025; j_025++)
            {
                cout << arr_025[i_025][j_025] << " ";
            }
            cout << endl;
        }
    }
```

```cpp
};
int main()
{
    int row_025, col_025;
    cout << "Enter the number of rows and columns: ";
    cin >> row_025 >> col_025;
    matrix_025<int> m1_025(row_025, col_025);
    m1_025.get_data_025();
    m1_025.display_025();
    matrix_025<int> m2_025(row_025, col_025);
    m2_025.get_data_025();
    m2_025.display_025();
    matrix_025<int> m3_025 = m1_025 + m2_025;
    m3_025.display_025();
    return 0;
}
```

OUTPUT-8

```
PROBLEMS  OUTPUT  DEBUG CONSOLE  TERMINAL                                  Code

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PS D:\my codes\OOPS\LAB10_TEMPLATER> cd "d:\my codes\OOPS\LAB10_TEMPLATER\" ; if ($?) { g++ q8.cpp -o q8 } ; if
($?) { .\q8 }
Enter the number of rows and columns: 3 3
Enter the elements of the matrix:
1 2 3 4 5 6 7 8 9
The matrix is:
1 2 3
4 5 6
7 8 9
Enter the elements of the matrix:
9 8 7 6  5 4 3 2 1
The matrix is:
9 8 7
6 5 4
3 2 1
The matrix is:
10 10 10
10 10 10
10 10 10
PS D:\my codes\OOPS\LAB10_TEMPLATER>
```

```
//Q9) (Class Template) Design a generic stack class which can be
used to
// create integer, character or floating point stack objects.
//Provide all necessary data members and member functions
//(push, pop, display &amp;amp; default constructor) to operate on the
stack.

#include <bits/stdc++.h>
 using namespace std;
template <class T_025>
class Stack_025
{
private:
    int top_025;
    int capacity_025;
    T_025 *array_025;

public:
    T_025 last_pop_025;
    Stack_025(int capacity_025)
    {
        this->capacity_025 = capacity_025;
        top_025 = -1;
        array_025 = new T_025[capacity_025];
        last_pop_025 = -9999;
    }
    void push_025(T_025 element_025)
    {
        if (top_025 == capacity_025 - 1)
        {
            cout << "Stack Overflow" << endl;
            return;
        }
        top_025++;
        array_025[top_025] = element_025;
    }
    void pop_025()
    {
        if (top_025 == -1)
        {
            cout << "Stack Underflow" << endl;
```

```
            return;
        }
        int temp_025 = top_025--;
        last_pop_025 = array_025[temp_025];
        cout << "Popped Element - " << last_pop_025 << endl;
    }
    void display_025()
    {
        if (top_025 == -1)
        {
            cout << "Stack is Empty" << endl;
            return;
        }
        cout << "Stack Element: " << endl;
        for (int i_025 = top_025; i_025 >= 0; i_025--)
        {
            cout << array_025[i_025] << " ";
        }
        cout << endl;
    }
};
int main()
{
    int choice_025, n_025;
    cout << "Enter the size of the stack: ";
    cin >> n_025;
    cout << "Enter 1 for Char Stack." << endl;
    cout << "Enter 2 for Integer Stack." << endl;
    cout << "Enter 3 for Float Stack." << endl;
    cout << "Enter Your Choice - ";
    cin >> choice_025;
    switch (choice_025)
    {
    case 1:
    {
        Stack_025<char> s_025(n_025);
        char element_025;
        while (1)
        {
            cout << "1. Push" << endl;
            cout << "2. Pop" << endl;
            cout << "3. Display" << endl;
            cout << "4. Exit" << endl;
```

```
            cout << "Enter Your Choice - ";
            cin >> choice_025;
            switch (choice_025)
            {
            case 1:
            {
                cout << "Enter the element to be pushed - ";
                cin >> element_025;
                s_025.push_025(element_025);
                break;
            }
            case 2:
            {
                s_025.pop_025();
                break;
            }
            case 3:
            {
                s_025.display_025();
                break;
            }
            case 4:
            {
                exit(0);
            }
            default:
            {
                cout << "Wrong Choice" << endl;
            }
            }
        }
    }
    break;
    case 2:
    {
        Stack_025<int> s_025(n_025);
        int element_025;
        while (1)
        {
            cout << "1. Push" << endl;
            cout << "2. Pop" << endl;
            cout << "3. Display" << endl;
            cout << "4. Exit" << endl;
```

```
            cout << "Enter Your Choice - ";
            cin >> choice_025;
            switch (choice_025)
            {
            case 1:
            {
                cout << "Enter the element to be pushed - ";
                cin >> element_025;
                s_025.push_025(element_025);
                break;
            }
            case 2:
            {
                s_025.pop_025();
                break;
            }
            case 3:
            {
                s_025.display_025();
                break;
            }
            case 4:
            {
                exit(0);
            }
            default:
            {
                cout << "Wrong Choice" << endl;
            }
            }
        }
    }
    break;
    case 3:
    {
        Stack_025<float> s_025(n_025);
        float element_025;
        while (1)
        {
            cout << "1. Push" << endl;
            cout << "2. Pop" << endl;
            cout << "3. Display" << endl;
            cout << "4. Exit" << endl;
```

```
            cout << "Enter Your Choice - ";
            cin >> choice_025;
            switch (choice_025)
            {
            case 1:
            {
                cout << "Enter the element to be pushed - ";
                cin >> element_025;
                s_025.push_025(element_025);
                break;
            }
            case 2:
            {
                s_025.pop_025();
                break;
            }
            case 3:
            {
                s_025.display_025();
                break;
            }
            case 4:
            {
                exit(0);
            }
            default:
            {
                cout << "Wrong Choice" << endl;
            }
            }
        }
    }
    default:
        cout << "Wrong Choice" << endl;
    }
    return 0;
}
```

OUTPUT-9

```
PROBLEMS  OUTPUT  DEBUG CONSOLE  TERMINAL                                  Code

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PS D:\my codes\OOPS\LAB10_TEMPLATER> cd "d:\my codes\OOPS\LAB10_TEMPLATER\" ; if ($?) { g++ q9.cpp -o q9 } ; if
($?) { .\q9 }
q9.cpp: In instantiation of 'Stack_025<T_025>::Stack_025(int) [with T_025 = char]':
q9.cpp:75:36:   required from here
q9.cpp:23:24: warning: overflow in conversion from 'int' to 'char' changes value from '-9999' to ''\37777777761
' [-Woverflow]
   23 |         last_pop_025 = -9999;
      |                        ^~~~~
Enter Your Choice - 2
1. Push
2. Pop
3. Display
4. Exit
Enter Your Choice - 1
Enter the element to be pushed - 32
1. Push
2. Pop
3. Display
4. Exit
Enter Your Choice - 1
Enter the element to be pushed - 324
1. Push
2. Pop
3. Display
4. Exit
Enter Your Choice - 1
Enter the element to be pushed - 3242
1. Push
2. Pop
3. Display
4. Exit
```

```
Enter Your Choice - 2
1. Push
2. Pop
3. Display
4. Exit
Enter Your Choice - 1
Enter the element to be pushed - 32
1. Push
2. Pop
3. Display
4. Exit
Enter Your Choice - 1
Enter the element to be pushed - 324
1. Push
2. Pop
3. Display
4. Exit
Enter Your Choice - 1
Enter the element to be pushed - 3242
1. Push
2. Pop
3. Display
4. Exit
Enter Your Choice - 3
Stack Element:
3242 324 32
1. Push
2. Pop
3. Display
4. Exit
Enter Your Choice - 4
PS D:\my codes\OOPS\LAB10_TEMPLATER>
```

```
Ln 11, Col 9  Spaces: 4  UTF-8  CRLF  C++  Win32
```

```
/*Q10) (Class Template) Design a template Stack which can
 work with either a Student record or an Employee record.
  [A Student record contains name, rollNo and cgpa.
   An Employee record contains name, empId and salary fields.
    Provide push, pop, display functions to the template stack
class.]*/

#include <bits/stdc++.h>
using namespace std;
class Employee_025
{
private:
    string name_025;
    int id_025;
    int salary_025;

public:
    Employee_025()
    {
        name_025 = "";
        id_025 = 0;
        salary_025 = 0;
    }
    Employee_025(string name_025, int id_025, int salary_025)
    {
        this->name_025 = name_025;
        this->id_025 = id_025;
        this->salary_025 = salary_025;
    }
    void display_025()
    {
        cout << "Name: " << name_025 << endl;
        cout << "ID: " << id_025 << endl;
        cout << "Salary: " << salary_025 << endl;
    }
};
```

```
class Student_025
{
private:
    string name_025;
    int rollno_025;
    int cgpa_025;

public:
    Student_025()
    {
        name_025 = "";
        rollno_025 = 0;
        cgpa_025 = 0;
    }
    Student_025(string name_025, int rollno_025, int cgpa_025)
    {
        this->name_025 = name_025;
        this->rollno_025 = rollno_025;
        this->cgpa_025 = cgpa_025;
    }
    void display_025()
    {
        cout << "Name: " << name_025 << endl;
        cout << "Roll No: " << rollno_025 << endl;
        cout << "CGPA: " << cgpa_025 << endl;
    }
};
template <class T_025>
class stack_025
{
private:
    T_025 *arr_025;
    int top_025;
    int capacity_025;

public:
    T_025 last_pop_025;
    stack_025(int capacity_025)
    {
        this->capacity_025 = capacity_025;
        arr_025 = new T_025[capacity_025];
        top_025 = -1;
    }
```

```
    void push_025(T_025 ele_025)
    {
        if (top_025 == capacity_025 - 1)
        {
            cout << "Stack Overflow" << endl;
            return;
        }
        arr_025[++top_025] = ele_025;
    }
    void pop_025()
    {
        if (top_025 == -1)
        {
            cout << "Stack Underflow" << endl;
            return;
        }
        last_pop_025 = arr_025[top_025--];
    }
    void display_025()
    {
        if (top_025 == -1)
        {
            cout << "Stack is Empty" << endl;
            return;
        }
        for (int i_025 = top_025; i_025 >= 0; i_025--)
        {
            arr_025[i_025].display_025();
        }
    }
};
int main()
{
    int choice_025;
    while (1)
    {
        cout << "1. Employee" << endl;
        cout << "2. Student" << endl;
        cout << "3. Exit" << endl;
        cout << "Enter your choice: ";
        cin >> choice_025;
        switch (choice_025)
        {
```

```
        case 1:
        {
            cout << "Enter the size of the stack: ";
            int size_025;
            cin >> size_025;
            stack_025<Employee_025> s_025(size_025);
            choice_025 = 0;
            while (choice_025 != 4)
            {
                cout << "1 - Push Element to Stack.\n";
                cout << "2 - Pop Element from Stack.\n";
                cout << "3 - Display Stack.\n";
                cout << "4 - Exit.\n";
                cout << "Enter your choice: ";
                cin >> choice_025;
                switch (choice_025)
                {
                case 1:
                {
                    string name_025;
                    int id_025, salary_025;
                    cout << "Enter the name: ";
                    cin >> name_025;
                    cout << "Enter the id: ";
                    cin >> id_025;
                    cout << "Enter the salary: ";
                    cin >> salary_025;
                    s_025.push_025(Employee_025(name_025, id_025,
salary_025));
                    break;
                }
                case 2:
                {
                    cout << "Popped Element - ";
                    s_025.pop_025();
                    s_025.last_pop_025.display_025();
                    break;
                }
                case 3:
                {
                    cout << "Stack : " << endl;
                    s_025.display_025();
                    break;
```

```
                }
                case 4:
                {
                    break;
                }
                default:
                {
                    cout << "Invalid Choice" << endl;
                }
                }
            }
        }
        break;
        case 2:
        {
            cout << "Enter the size of the stack: ";
            int size_025;
            cin >> size_025;
            stack_025<Student_025> s_025(size_025);
            choice_025 = 0;
            while (choice_025 != 4)
            {
                cout << "1 - Push Element to Stack.\n";
                cout << "2 - Pop Element from Stack.\n";
                cout << "3 - Display Stack.\n";
                cout << "4 - Exit.\n";
                cout << "Enter your choice: ";
                cin >> choice_025;
                switch (choice_025)
                {
                case 1:
                {
                    string name_025;
                    int rollno_025, cgpa_025;
                    cout << "Enter the name: ";
                    cin >> name_025;
                    cout << "Enter the rollno: ";
                    cin >> rollno_025;
                    cout << "Enter the cgpa: ";
                    cin >> cgpa_025;
                    s_025.push_025(Student_025(name_025, rollno_025,
cgpa_025));
                    break;
```

```
                }
                case 2:
                {
                    s_025.pop_025();
                    break;
                }
                case 3:
                {
                    s_025.display_025();
                    break;
                }
                case 4:
                {
                    break;
                }
                default:
                {
                    cout << "Invalid Choice" << endl;
                }
                }
            }
        }
        break;
        case 3:
        {
            return 0;
        }
        default:
        {
            cout << "Invalid Choice" << endl;
        }
        }
    }
    return 0;
}
```

OUTPUT-10

```
Windows PowerShell
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Install the latest PowerShell for new features and improvements! https://aka.ms/PSWindows

PS D:\my codes\OOPS\LAB10_TEMPLATER> cd "d:\my codes\OOPS\LAB10_TEMPLATER\" ; if ($?) { g++ q10.cpp -o q10 } ; i
f ($?) { .\q10 }
1. Employee
2. Student
3. Exit
Enter your choice: 2
Enter the size of the stack: 5
1 - Push Element to Stack.
2 - Pop Element from Stack.
3 - Display Stack.
4 - Exit.
Enter your choice: 1
Enter the name: hitu
Enter the rollno: 25
Enter the cgpa: 10
1 - Push Element to Stack.
2 - Pop Element from Stack.
3 - Display Stack.
4 - Exit.
Enter your choice: 3
Name: hitu
Roll No: 25
CGPA: 10
1 - Push Element to Stack.
2 - Pop Element from Stack.
3 - Display Stack.
4 - Exit.
Enter your choice:
```