Computer Science & Engineering Department
I. I. T. Kharagpur

Principles of Programming Languages: CS40032

Elective

Assignment – 4: Lambda in C++ *Marks: 25*

Assign Date: *11rd February, 2021* Submit Date: *23:55, 18th February, 2021*

Instructions: Please solve the questions using pen and paper and scan the images. Every image should contain your roll number and name.

1. Answer the following questions based on the given instructions. **[15]**

   (a) Write output of the following code snippet. **2**

```
#include <iostream>
using namespace std;
int main(){
    auto con= 8;
    auto l = [&](int x) { return x*con; } ;
    --con;
    cout << l(5) << endl ;
    auto m = [=] ( int x ) { return x+con; } ;
    ++con;
    cout << l(5)<<endl<<m(5) <<endl ;
    return 0;
}
```

BEGIN SOLUTION

35
40
12

END SOLUTION

   (b) Write output of the following code snippet. **2**

```
#include <iostream>
using namespace std;
int main(){
    int c=5;
    auto f1 = [=] ( ) mutable {++c ; cout << c ; } ;
    auto f2 = [&] ( ) mutable {c+=3 ; cout << c ; } ;
    f1() ;
    f2() ;
    cout << c ;
    f2();
    cout << c ;
    return 0 ;
}
```

BEGIN SOLUTION

6881111

END SOLUTION

   (c) Write a code snippet containing a lambda expression in C++ that will do the following: **3**

   - Read a temperature value in Fahrenheit scale from the keyboard in a variable F.
   - Convert the temperature value to its corresponding value in Centigrade scale and store it in a variable C.
   - Print the value of C in the display.

   Note that the temperature values are real numbers. Also, they can be positive, negative, or 0.

BEGIN SOLUTION

```
#include <iostream>
using namespace std;
int main (){
    double Far;
    auto C = [&](double F) { return ((F-32)*5)/9;} ;
    cout<<"Enter temperature into Fahrenheit scale"<<endl;
    cin>>Far;
    auto c = C(Far);
    cout <<"In Centigrade scale:- "<<c<< endl ;
    return 0;
}
```

END SOLUTION

(d) Write a code snippet containing a lambda expression in C++ that will do the following: **3**

- Read the length L and width W of a rectangle.
- Compute the area A and perimeter P of the rectangle.
- Print the values of A and P with a suitable message.

You can assume that L and W are integers.

BEGIN SOLUTION

```
#include <iostream>
using namespace std;
int main (){
    int L,W;
    auto Area = [&](int Len,int Wid) { return Len*Wid;};
    auto Perimeter = [&](int Len,int Wid) { return 2*(Len+Wid);};
    cout<<"Enter length and width of rectangle respectively (Both in integer)"<<e
    cin>>L>>W;
    auto A = Area(L,W);
    auto P = Perimeter(L,W);
    cout<<"Area:- "<<A<< endl ;
    cout<<"Perimeter:- "<<P<<endl;
    return 0;
}
```

END SOLUTION

(e) Write a code snippet containing a lambda expression in C++ to compute and print the taxi fare based on the following chart. Total number of Kilometers traveled will be input by the user as an integer. **5**

First 12 KM: Rs. 100/-
Next 4 KM: Rs. 8 / KM
Next 4 KM: Rs 6 / KM
Above 20 KM: Rs 5 / KM

The program will -

- Read in the distance traveled (integer but don't enter 0).
- Print out the corresponding fare.

Example:- If user input is 27, then the total fare will be- (100+(4*8)+(4*6)+(7*5)) = 191.

BEGIN SOLUTION

```
#include <iostream>
using namespace std;
int main (){
    int dis;
    auto Fare = [&](int D) {
        long int f = 0;
        if(D>20){
            f+=(100+(4*8)+(4*6)+ (D-20)*5);
```

```
            }
            else if(D>16){
                f+=(100+(4*8)+(D-16)*6);
            }
            else if(D>12){
                f+=(100+(D-12)*8);
            }
            else{
                f+=100;
            }
            return f;
        };
        cout<<"Enter total number of distance travelled by user(In integer):-"<<endl;
        cin>>dis;
        auto F = Fare(dis);
        cout<<"Total fare:- "<<F<<endl;
    }
```

END SOLUTION

2. Write a C++ code to print all permutations of a given string using

   (a) Functors.

   (b) Lambda Expression.

[5 * 2 = 10]

You can print the permutations in any order and no character will be repeated in input string.
Example: - For string ABC permutations will be:
ABC
ACB
BAC
BCA
CAB
CBA

BEGIN SOLUTION

2.a.

```
#include <bits/stdc++.h>
using namespace std;
class permute{
    public:
        void operator()(string a, int l, int r){
            //Base case
            if(l==r)
                cout<<a<<endl;
            else{
                for(int i=l ; i<=r ; i++ ){
                    //Swapping
                    swap(a[l],a[i]);
                    //Recursion
                    (*this)(a,l+1,r);
                    //backtracking
                    swap(a[l], a[i]);
                }
            }
        }
    };
int main(){
    string st;
    cout<<"Enter the string:-"<<endl;cin>>st;
    cout<<endl<<"Permutations:-"<<endl;
    int len = st.size();
    permute p;
```

```
    p(st,0,len-1);
    return 0;
}
```

2.b.

```
#include <bits/stdc++.h>
using namespace std;
int main(){
    string st;
    cout<<"Enter the string:-"<<endl;
    cin>>st;
    cout<<endl<<"Permutations:-"<<endl;
    int len = st.size();
    //Lambda expression
    function<void(string , int , int)> permute = [&](string a, int l, int r){
        if(l==r){
            cout<<a<<endl;
            return;
        }
        else{
            for(int i=l ; i<=r ; i++ ){
                //Swapping
                swap(a[l],a[i]);
                //Recursion
                permute(a,l+1,r);
                //backtracking
                swap(a[l], a[i]);
            }
        }
        return;
    };
    permute(st,0,len-1);
    return 0;
}
```

END SOLUTION