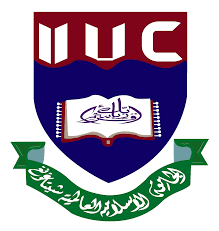
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**Department of Computer Science and Engineering**

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**Course Code : CSE- 4746**

**Course Title : Numerical Methods Lab**

**Submitted By:**

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**Submitted To:**

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**Professor**

**Dept. Of CSE, IIUC**

**Question 01: The following values of f (x) are given.**

**x: 1 2 3 4 5**

**y = f(x):1 8 27 64 125**

**Write a program to find difference table for the above values.**

**Solution**:

*#include*<bits/stdc++.h>

*using* *namespace* std;

int main()

{

    int n;

    int a[20][20], b[20];

    cin*>>*n;

*for*(int i*=*0;i*<*n;i*++*)

    {

        cout *<<* "b [" *<<* i *<<* "] = ";

        cin *>>* b[i];

        cout *<<* "a[" *<<* i *<<*"] = ";

        cin *>>* a[i][0];

    }

*for*(int i *=* 1; i *<* n; i*++*)

    {

*for*(int j *=* 0; j *<* n*-*i; j*++*)

    {

    a[j][i] *=* a[j*+*1][i*-*1] *-* a[j][i*-*1];

    }

    }

    cout *<<* endl *<<* "FORWARD DIFFERENCE TABLE" *<<* endl;

*for*(int i *=* 0; i *<* n; i*++*)

    {

    cout *<<* b[i];

*for*(int j *=* 0; j *<* n*-*i ; j*++*)

    {

    cout *<<* "\t" *<<* a[i][j];

    }

    cout *<<* endl;

    }

*return* 0;

}

**Question 2**: **The following values of f (x) are given.**

**X: 1 2 3 4 5**

**y = f(x): 1 8 27 64 125**

**Write a program to find the values of y when x = 1.7 by using Newton forward interpolation formula.**

**Code:**

*#include*<bits/stdc++.h>

*using* *namespace* std;

float u\_cal(float u, int n)

{

    float temp *=* u;

*for* (int i *=* 1; i *<* n; i*++*)

        temp *=* temp *\** (u *-* i);

*return* temp;

}

int fact(int n)

{

    int f *=* 1;

*for* (int i *=* 2; i *<=* n; i*++*)

        f *\*=* i;

*return* f;

}

int main()

{

    float n *=* 5;

    float x[] *=* {1,2,3,4,5 };

    float y[5][5];

    y[0][0] *=* 1;

    y[1][0] *=* 8;

    y[2][0] *=* 27;

    y[3][0] *=* 64;

    y[4][0] *=* 125;

*for* (int i *=* 1; i *<* n; i*++*) {

*for* (int j *=* 0; j *<* n *-* i; j*++*)

            y[j][i] *=* y[j *+* 1][i *-* 1] *-* y[j][i *-* 1];

    }

*for* (int i *=* 0; i *<* n; i*++*) {

        cout *<<* setw(4) *<<* x[i]

*<<* "\t";

*for* (int j *=* 0; j *<* n *-* i; j*++*)

            cout *<<* setw(4) *<<* y[i][j] *<<* "\t";

        cout *<<* endl;

    }

    float value *=* 1.7;

    float sum *=* y[0][0];

    float u *=* (value *-* x[0]) */* (x[1] *-* x[0]);

*for* (int i *=* 1; i *<* n; i*++*) {

        sum *=* sum *+* (u\_cal(u, i) *\** y[0][i]) */* fact(i);

    }

    cout *<<* "\n Value at " *<<* value *<<* " is "

*<<* sum *<<* endl;

*return* 0;

}

**Question 03**: **The following values of f (x) are given.**

**x 1 2 3 4 5**

**y = f(x) 1 8 27 64 125**

**Write a program to find the values of y when x = 4.7 by using Newton backward interpolation formula.**

**Code:**

*#include*<bits/stdc++.h>

*using* *namespace* std;

float calculate(float u, int n)

{

    float temp *=* u;

*for* (int i *=* 1; i *<* n; i*++*)

        temp *=* temp *\** (u *-* i);

*return* temp;

}

int calculateFactorials(int n)

{

    int f *=* 1;

*for* (int i *=* 2; i *<=* n; i*++*)

        f *\*=* i;

*return* f;

}

int main()

{

    int n *=* 5;

    float x[] *=* {1,2,3,4,5};

    float y[5][5];

    y[0][0] *=* 1;

    y[1][0] *=* 8;

    y[2][0] *=* 27;

    y[3][0] *=* 64;

    y[4][0]*=* 125;

*for* (int i *=* 1; i *<* n; i*++*) {

*for* (int j *=* 0; j *<* n *-* i; j*++*)

            y[j][i] *=* y[j *+* 1][i *-* 1] *-* y[j][i *-* 1];

    }

*for* (int i *=* 0; i *<* n; i*++*) {

        cout *<<* setw(4) *<<* x[i]

*<<* "\t";

*for* (int j *=* 0; j *<* n *-* i; j*++*)

            cout *<<* setw(4) *<<* y[i][j]

*<<* "\t";

        cout *<<* endl;

    }

    float value *=* 4.7;

    float sum *=* y[0][0];

    float u *=* (value *-* x[0]) */* (x[1] *-* x[0]);

*for* (int i *=* 1; i *<* n; i*++*) {

        sum *=* sum *+* (calculate(u, i) *\** y[0][i]) */*

            calculateFactorials(i);

    }

    cout *<<* "\n Value at " *<<* value *<<* " is "

*<<* sum *<<* endl;

*return* 0;

}