**Problem No: 01**

**Problem Name:** Find e^(1.17) from the following values of x and f(x):

1.00 1.05 1.10 1.15 1.20 1.25 1.30

2.7183 2.8577 3.0042 3.1582 3.3201 3.4903 3.6693

**Objective:** To find functional value from Gauss’s Forward and Backward Formula.

**Source Code:**

#include <iostream>

using namespace std;

double fb(double p, int i);

double fact(int i);

int main()

{

int n = 7, i, j;

double y, del[7][7], p, p1, x0 = 1.15, x = 1.17, h = 0.05;

p = (x - x0) / h;

double X[7] = {1.00, 1.05, 1.10, 1.15, 1.20, 1.25, 1.30};

double fx[7] = {2.7183, 2.8577, 3.0042, 3.1582, 3.3201, 3.4903, 3.6693};

y = 0;

for(j = 0; j < 7; j++){

del[0][j] = fx[j];

}

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

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

del[i][j] = del[i - 1][j + 1] - del[i - 1][j];

cout << "Difference Table:\n";

for(j = 0; j < n; j++){

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

if(del[i][j] > 0.000001)

cout << del[i][j] << " ";

else

cout << "0" << " ";

}

cout << endl;

}

j = 1;

int k = 1;

p1 = p;

cout << "\np: " << p << endl;

cout << "\nForward Difference Formula: \n";

for(i = 0; i < 4; i++){

cout << del[i][(n - i)/ 2] << " ";

}

for(i = 0; i < 4; i++){

if(i == 0){

y += (del[i][(n - i) / 2]);

}

else if(i == 1){

y += (del[i][(n - i) / 2]) \* p;

}

else if(i % 2 == 0){

p1 \*= (p - j); j++;

y += (del[i][(n - i) / 2] \* p1) / fact(i);

}

else if(i % 2 == 1) {

p1 \*= (p + k); k++;

y += (del[i][(n - i) / 2] \* p1) / fact(i);

}

}

cout << "\nResult: " << y << endl;

p1 = p;

y = 0;

cout << "\nBackward Difference Formula: \n";

for(i = 0; i < 4; i++){

if(i == 0){

y += (del[i][(n - i) / 2]);

cout << del[i][(n - i) / 2] << " ";

}

else if(i == 1){

y += (del[i][(n - i) / 2 - 1]) \* p;

cout << del[i][(n - i) / 2 - 1] << " ";

}

else if(i == 3){

p1 \*= (p - j); j++;

y += (del[i][(n - i) / 2 - 1] \* p1) / fact(i);

cout << del[i][(n - i) / 2 - 1] << " ";

}

else if(i == 2) {

p1 \*= (p + k); k++;

y += (del[i][(n - i) / 2] \* p1) / fact(i);

cout << del[i][(n - i) / 2] << " ";

}

}

cout << "\nResult: " << y << endl;

return 0;

}

double fact(int i)

{

double j, f = 1.0;

for(j = 1.0; j <= i; j++)

f \*= j;

if(i == 0)

return 1;

else

return f;

}

**Output:**

