**Problem No: 01**

**Problem Name:** Solve the equation x = (1 + cosx)/3 by using both Iteration & Newton-Raphson method.

**Objective:** To solve an equation by using Iteration & Newton-Raphson method.

**Source Code:**

#include <iostream>

#include <cmath>

double x0, x1;

int i = 1;

double func(double x);

double diffunc(double x);

void iter();

void nr();

using namespace std;

int main()

{

cout << "Given Equation:\n x = (1 + cosx)/3" << endl;

int n;

cout << "Choose option\n" << "1. Iteration\n" << "2. Newton-Raphson\n" << "3. Exit\n";

while(1){

cin >> n;

if(n == 1){

cout << "\nIteration Method\n\n";

iter();

}

if(n == 2){

cout << "\nNewton-Raphson Method\n\n";

nr();

}

if(n == 3){

cout << "Ending Program\n";

break;

}

}

}

double func(double x)

{

double f;

f = 1 - (3 \* x) + cos(x);

return f;

}

double diffunc(double x)

{

double df;

df = -3 - sin(x);

return df;

}

void iter()

{

cout << "Choose an initial value: ";

cin >> x0;

i = 1;

cout << "x1: " << x0 << endl;

while(1){

i++;

x1 = (1 + cos(x0)) / 3;

if(abs(x1 - x0) <= 0.0001){

cout << "\nRoot: " << x1 << endl << endl;break;

}

else{

cout << "x" << i << ": " << x1 << endl;

x0 = x1;

}

}

}

void nr()

{

cout << "Choose an initial value: ";

cin >> x0;

i = 1;

cout << "x1: " << x0 << endl;

while(1){

i++;

x1 = x0 - (func(x0) / diffunc(x0));

if(abs(x1 - x0) <= 0.0001){

cout << "\nRoot: " << x1 << endl << endl;break;

}

else{

cout << "x" << i << ": " << x1 << endl;

x0 = x1;

}

}

return;

}

**Output:**

