

## EXPERIMENT NO.: 06

**6.1 Objective:** To evaluate the solution of fourth order differential equation by R K method using C/C++.

**6.2 Theory:** The solution of the differential equation of first order  $\frac{dy}{dx} = f(x, y)$  is given by the formula:

$$k_1 = h \times f(x_0, y_0)$$

$$k_2 = h \times f\left(x_0 + \frac{h}{2}, y_0 + \frac{k_1}{2}\right)$$

$$k_3 = h \times f\left(x_0 + \frac{h}{2}, y_0 + \frac{k_2}{2}\right)$$

$$k_4 = h \times f(x_0 + h, y_0 + k_3)$$

$$\Delta y = \frac{1}{6} \times [k_1 + 2(k_2 + k_3) + k_4]$$

$$Y_1 = y_0 + \Delta y$$

**6.3 Procedure/Code:**

```
#include<iostream.h>
#include<conio.h>
#include<math.h>

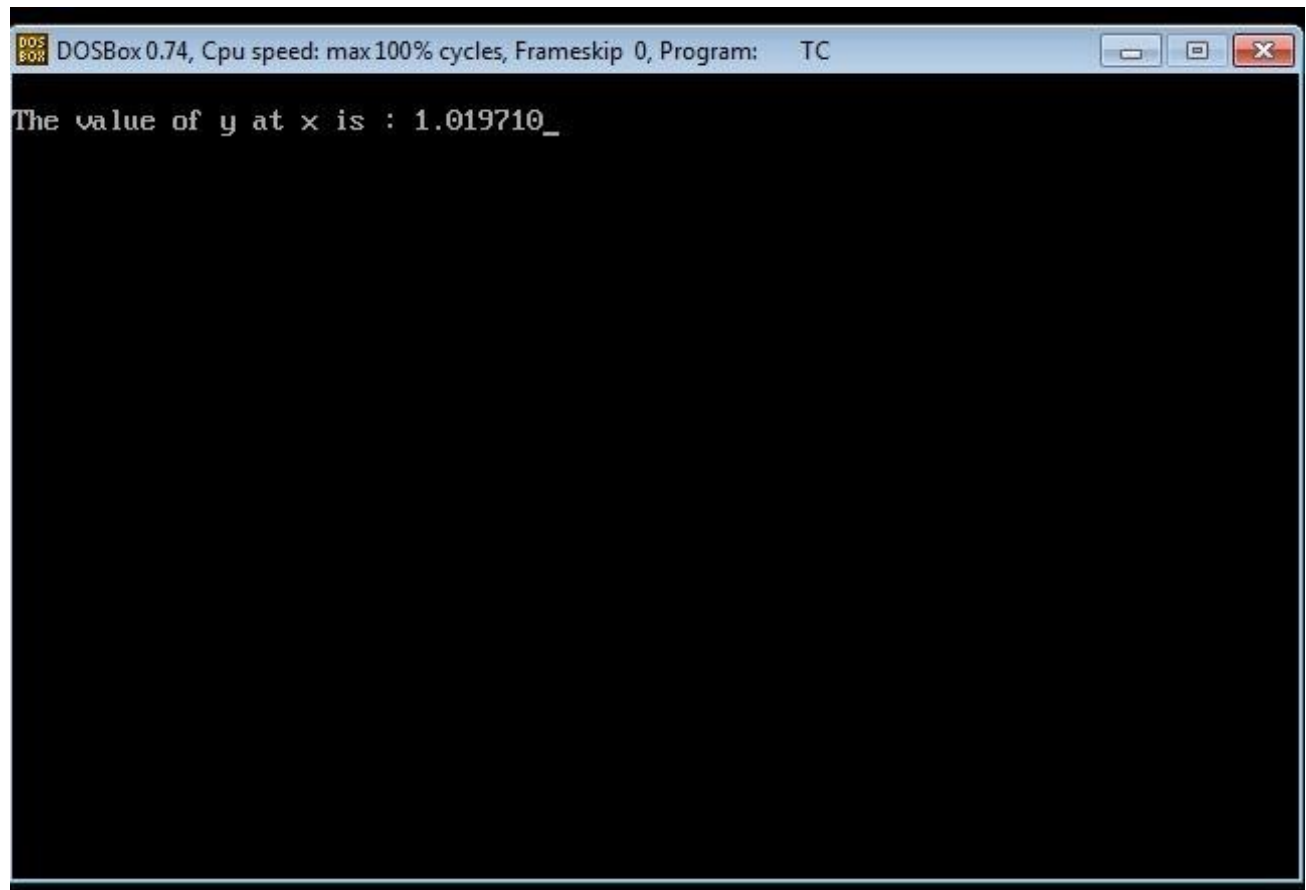
float dydx(float x, float y)
{
    return((x - y)/2);
}

float RungeKutta(float x0, float y0, float x, float h)
{
    int n = (int)((x - x0) / h);

    float k1, k2, k3, k4, k5;
```

```
float y = y0;
for (int i=1; i<=n; i++)
{
    k1 = h*dydx(x0, y);
    k2 = h*dydx(x0 + 0.5*h, y + 0.5*k1);
    k3 = h*dydx(x0 + 0.5*h, y + 0.5*k2);
    k4 = h*dydx(x0 + h, y + k3);
    y = y + (1.0/6.0)*(k1 + 2*k2 + 2*k3 + k4);
    x0 = x0 + h;
}
return y;
}
int main()
{
    clrscr();
    float x0 = 0, y = 1, x = 2, h = 0.2;
    printf("\nThe value of y at x is : %f", RungeKutta(x0, y, x, h));
    return 0;
    getch();
}
```

## 6.4 Output:



The screenshot shows a DOSBox window with a title bar that reads "DOSBox 0.74, Cpu speed: max 100% cycles, Frameskip 0, Program: TC". The window contains a black terminal area with the text "The value of y at x is : 1.019710\_" displayed in a monospaced font. The text is positioned at the top left of the terminal area, and a cursor is visible at the end of the line.

## EXPERIMENT NO.: 05

**5.1 Objective:** To evaluate the solution of first order differential equation by Euler's Method using C/C++.

**5.2 Theory:** The solution of the differential equation of first order  $\frac{d}{dx} = f(x, y)$  is given by the formula:

$$y_{n+1} = y_n + h f(x_n, y_n)$$

**5.3 Procedure/Code:**

```
#include<iostream.h>
#include<conio.h>
#include<math.h> using
namespace std; float
func(float x, float y)
{
    return (x + y + x * y);
}
void Euler(float x0, float y, float h, float x)
{
    float temp = -0;
    while (x0 < x)
    {
        temp = y;
        y = y + h * func(x0, y);
        x0 = x0 + h;
    }
    cout << "Approximate solution at x = "
        << x << " is " << y << endl;
}
int main()
{
    clrscr();
    float x0 = 0;
    float y0 = 1;
    float h = 0.025;
    float x = 0.1;
```

```
Euler(x0, y0, h, x);  
getch();  
return 0;  
}
```

#### 5.4 Output:

