ASSIGNMENT NO:14 **DATE:17/04/2015**

PROGRAM STATEMENT:Given dy/dx=x-y ,y(0)=1,compute y(0.4), by Runge-Kutta method taking step length h =.1, correct upto 5 decimal places

THEORY: Fourth order RUNGE-KUTTA METHOD:The computational formula for fourth order runge-kutta method can be derived in similar manner as in second order,by considering term up to h^4,as follows..

$$y(x_0+h)=y_0+k$$

where $k=[k_1+2k_2+2k_3+k_4)$

$$k_1=h(f)_0$$

$$k_2=hf(x_0+h/2,y_0+k_1/2)$$

$$k_3=hf(x_0+h/2,y_0+k_2/2)$$

$$k_4=hf(x_0+h,y_0+k_3)$$

Here h is the difference two intervals.

PROGRAM CODE:

```
//C Program to Find Solution of Ordinary Differential Equation of 1st Order by Runge-Kutta Method of Order 4
#include <stdio.h>
#include <math.h>
double error(int a)
{
      return 5*pow(10,-a-1);
}
double mod(double x)
{
      if(x<0)
            return -x;
      else
            return x;
}
double f(double x,double y)
{
      return (x-y);
}
int main()
{
      double x0,x,y0,h,k,k1,k2,k3,k4;
      printf("f(x,y)=x-y\nEnter Value of x::");
      scanf("%lf",&x0);
      printf("Enter Value of y for x=%4.2lf::",x);
      scanf("%lf",&y0);
      printf("Enter Step length h::");
      scanf("%lf",&h);
      printf("Enter value of x for which y is to be computed::");
      scanf("%lf",&x);
      printf("y(%4.2lf)=%.4lf\n",x0,y0);
      while(x0<x)
      {
            k1=h*f(x0,y0);
            k2=h*f(x0+(h/2),y0+(k1/2));
            k3=h*f(x0+(h/2),y0+(k2/2));
            k4=h*f(x0+h,y0+k3);
            k=(k1+2*(k2+k3)+k4)/6;
```

```
            y0=y0+k;
            x0=x0+h;
            printf("y(%4.2lf)=%.4lf\n",x0,y0);
      }
      return 0;
}
```

OUTPUT:

```
f(x,y)=x-y
Enter Value of x::0
Enter Value of y for x=0.00::1
Enter Step length h::.1
Enter value of x for which y is to be computed::.4
y(0.00)=1.0000
y(0.10)=0.9097
y(0.20)=0.8375
y(0.30)=0.7816
y(0.40)=0.7406
```