ASSIGNMENT NO:4 **DATE:13/02/2015**

PROGRAM STATEMENT:Evaluate $_0\int^1$ $(1/\sqrt{(1+x^2)})$ taking 10 intervals by Simpson's One third Rule

THEORY : It is a three-point quadrature,i.e,n=2(n is number of intervals).Therefore there are only three functional values,$y_0=f(x_0)=f(a)$,$y1=f(x_0+h)=f(x_1)$ and $y_2=f(x_0+2h)=f(b)$,where h is the difference between two intervals. Thus $b-a=x_n-x_0=2h$.So the third and higher order differences are not possible. Substituting,n=2 and neglecting the third and higher order differences we get,

$I_s=h/3(y_0+4y_1+y_2)$.This formula is known as Simpson's 1/3rd rule for integration.

The composite Simpson's One-third Rule for numerical integration is...

I_SC=h/3*[Sum of first and last ordinats+4(Sum of all odd ordinates)+2(Sum of all even ordinates)]

PROGRAM CODE:

```
//C Program to implement Simpson's one-third formula for Numerical
Integration
#include <stdio.h>
#include <math.h>
#define EQ (1/(sqrt(1+pow(x,2))))
int main()
{
      int i=0,n;
      double x,s=0,h,u,l;
      printf("The equation we are solving is->   y=1/(sqrt(1+x^2))\n");
      printf("\n\tEnter upper limit::");
      scanf("%lf",&u);
      printf("\n\tEnter lower limit::");
      scanf("%lf",&l);
      printf("\n\tEnter number of intervals::");
      scanf("%d",&n);
      h=(u-l)/n;
      x=l;
      double a[n+1];
      for(i=0;i<=n;i++)
      {
            a[i]=EQ;
            printf("\n\t%lf\t%lf",x,a[i]);
            x=x+h;
            if((i==0)||(i==n))
            {
                  s=s+a[i];
            }
            else
            {
                  if(i%2)
                  {
                        s=s+(4*a[i]);
                  }
                  else
                  {
                        s=s+(2*a[i]);
                  }
            }
      }
```

```
      s=s*h/3;
      if(n%2==0)
            printf("\n\t Value by Simpson's one-third rule is %lf\n",s);
      else
            printf("\n\tNumber of intervals odd.");
      return 0;
}
```

OUTPUT:

```
The equation we are solving is->   y=1/(sqrt(1+x^2))

      Enter upper limit::1

      Enter lower limit::0

      Enter number of intervals::10

      0.000000   1.000000
      0.100000   0.995037
      0.200000   0.980581
      0.300000   0.957826
      0.400000   0.928477
      0.500000   0.894427
      0.600000   0.857493
      0.700000   0.819232
      0.800000   0.780869
      0.900000   0.743294
      1.000000   0.707107
       Value by Simpson's one-third rule is 0.881374
```