# Experiment : 8

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**Subject :** Electromagnetics
**Course :** B.Sc. Hons. Electronics
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# Experiment : 8

**Aim :** Solutions of Poisson and Laplace Equations – contour plots of charge and potential distributions.

**Apparatus Required :** A desktop with Scilab installed in it.

**Theory :**

The Poisson Equation is given by :

$$\nabla 2V = \rho v/\varepsilon$$

This is known as the equation of Poisson in one dimension where potential varies with x.

If we are to represent the Poisson's equation in three dimension where V varies with x , y and z we can similarly prove in vector notation :

$$\frac{d^2V}{dx^2} + \frac{d^2V}{dy^2} + \frac{d^2V}{dz^2} = -\frac{\rho}{\epsilon_0} = \nabla^2 V$$

Under the special case where, the charge density is zero, the above equation of Poisson becomes:

$$\frac{d^2V}{dx^2} + \frac{d^2V}{dy^2} + \frac{d^2V}{dz^2} = 0$$

or, $\nabla^2 V = 0$ Where , $\nabla^2 = \frac{d^2V}{dx^2} + \frac{d^2V}{dy^2} + \frac{d^2V}{dz^2}$

This is known as Laplace's equation.

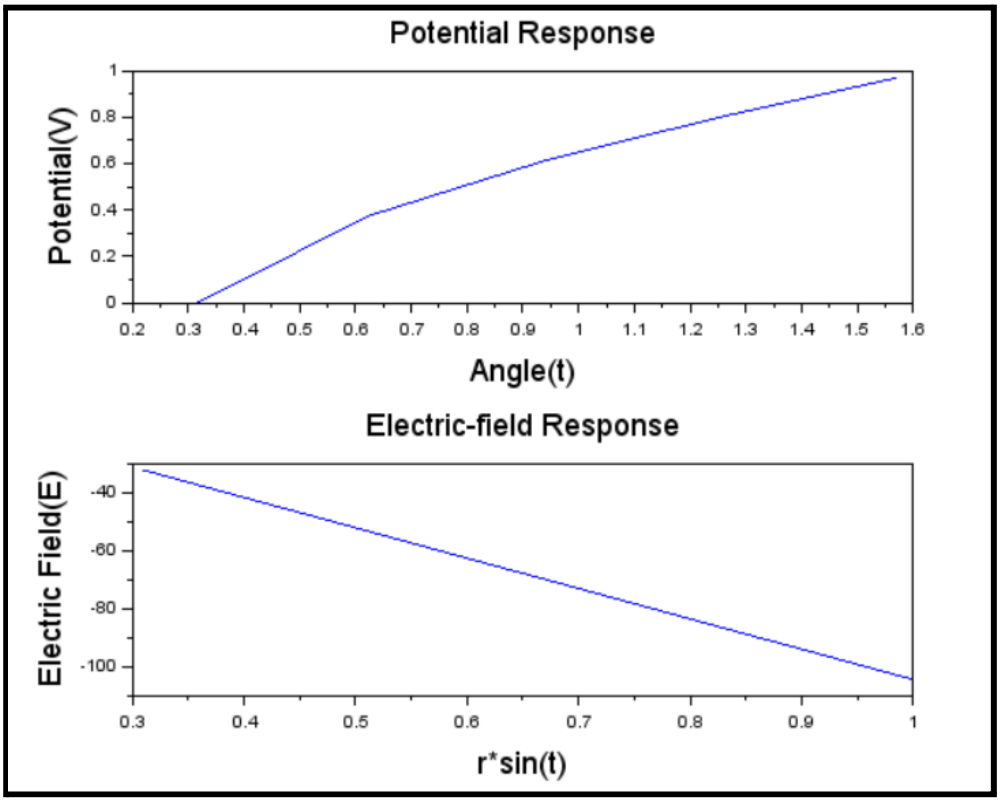
**Code :**

Expt-8-laplace-Vishal-Anand.sce

```
clc();
clear();
V = 55;
t = %pi / 10 : %pi / 10 : %pi / 2;
```

```
r = 1 : 10 : 10;
t1 = %pi / 10;
t2 = %pi / 6;
A = V / log ((tan ( t2 / 2 )) / tan( t1 / 2 ));
Va = V * log ((tan( t / 2 )) / tan( t1 / 2 )) / A;
subplot(211);
plot( t , Va );
title("Potential Response",'fontsize',4);
xlabel('Angle(t)','fontsize',4);
ylabel('Potential(V)','fontsize',4);
E = -A / r * sin ( t );
subplot(212);
plot( r * sin( t ) , E );
title("Electric-field Response",'fontsize',4);
xlabel('r*sin(t)','fontsize',4);
ylabel('Electric Field(E)','fontsize',4);
```

## Output :




**Result :** Solution to Laplace and Poisson equation was found using Scilab software and the contour plots were plotted.