**Problem1**: (i) solve the problem of simple harmonic oscillator and find out displacement of particle, its velocity and acceleration. Use initial conditions yourself as per the demand of the problems. The Eq. is,

$\frac{d^2x}{dt^2} + \omega^2 x = 0$, find out $x, \frac{dx}{dt}, \frac{d^2x}{dt^2}$ and plot them using scilab for 3 time periods i.e. t=3T.

Solution1(i)- analytical solution and plot using subplot on different graph as well as on a same graph.

```
// analytical simple harmonic oscillator
a=5; // centimeter is amplitude of oscillation
T=5; // second is the time period
t=0:0.01:3*T; // range of time for which solution is calculated
x=a*sin(2*%pi*t/T); // displacement
v=a*cos(2*%pi*t/T); // velocity
alpha=-1*a*(2*%pi/T)^2*sin(2*%pi*t/T); // acceleration
subplot(221)
plot(t,x)
hl=legend(['displacement']);
subplot(222)
plot(t,v)
hl=legend(['velocity']);
subplot(223)
plot(t,alpha)
hl=legend(['acceleration']);
```

Solution1(ii)- solve numerically using scilab and plot

**Problem2**: Extend the same problem to the damped harmonic oscillator and find out displacement of particle, its velocity and acceleration. Use initial conditions yourself as per the demand of the problems.

**Problem3**: Extend the same problem to the Forced harmonic oscillator and find out displacement of particle, its velocity and acceleration. Use initial conditions yourself as per the demand of the problems.

## try to solve and plot some more different type of differential equations yourself for practice.

All the Best.