Worksheet-III

1. In mass spring system, let $m = 2$,$c = 6$, $k = 27$ and $r(t) = 10\cos\omega t$. For what ω will you obtain the steady-state vibration of maximum possible amplitude? Determine this amplitude.Then use this ω and the undetermined coefficient to see whether you obtain the same amplitude.

2. Find the steady state solution of the mass spring system when $m = 4$,$c = 4$,$k = 17$ and the driving force is $202\cos 3t$.(method of undetermined coefficient)

3. Find the steady state and transient current in the RLC circuit for $R = 8\Omega$, $L = 0.5H$, $C = 0.1F$, $E = 100\sin 2t$V.(Variation of parameters)

4. Solve the initial value problem for the RLC circuit when $R = 4\Omega$, $L = 0.1H$, $C = 0.025F$, $E = 10\sin 10tV$. Assume zero initial charge and current.(variation of parameters)

5. Solve $y^{''} + 4y = t^2 + 8\cos(2t)$ by undetermined coefficients and by variation of parameters. Explain any differences in the answers.

6. Solve $y^{''} + 2y^{'} + y = e^{-t}\ln(t)$.

7. solve the following initial value problem using variation of parameter
   $y^{''} + 2y^{'} - 3y = te^t$ with conditions $y(0) = -\frac{1}{64}$, $y'(0) = -\frac{59}{64}$.

8. Consider the differential equation
   $t^2y^{''} + 3ty^{'} - 3y = 0$, $t > 0$

   (a) Determine r so that $y = t^r$ is a solution.

   (b) Use (a) to find a fundamental set of solution.

   (c) Use the method of variation of parameters for finding a particular solution to
   $t^2y^{''} + 3ty^{'} - 3y = \frac{1}{t^3}$, $t > 0$

9. Solve the differential equation $(2x + 3)^2y'' + 8(2x + 3)y' + 9y = 0$.