1. Find the steady state and transient state motion of the mass-spring system with mass $4\ kg$, damping constant $c = 8\ kg/sec$, spring constant $k = 3\ kg/sec^2$, and driving force $r(t) = 425\ \sin 2t\ newton$, where $y(0) = -16$ and $y'(0) = -26$.

2. Find the steady state and transient state motion of the mass-spring system with mass $m = 4\ kg$, damping constant $c = 4\ kg/sec$, spring constant $k = 17\ kg/sec^2$, and the driving force $r(t) = 202\ \cos 3t\ newton$.

3. In $L - R - C$ circuit the charge Q on the plate is given by $L\ \dfrac{d^2Q}{dt^2} + R\ \dfrac{dQ}{dt} + \dfrac{Q}{C} = E\ \sin pt$. The circuit tuned to resonance so that $p^2 = \dfrac{1}{LC}$. If initially the current $i(t)$ and the charge $Q(t)$ be zero, then show that for small values of $\dfrac{R}{L}$, the current in time t is given by $\dfrac{E\ t}{2\ L}\ \sin pt$.

4. Find the current in $L - R - C$ circuit when $L = 0.1\ H$, $R = 20\ \Omega$, $C = 2 \times 10^{-4}\ F$ and $E(T) = 110\ \sin 314t\ V$.