**7.31 In the LCR circuit the ac driving voltage is v = vm sin ωt.**

**(i) Write down the equation of motion for q (t).**

**(ii) At t = t0, the voltage source stops and R is short-circuited. Now write down how much energy is stored in each of L and C.**

**(iii) Describe subsequent motion of charges.**

Answer:

i) The equation for variation of motion of charge with respect to time is given as

$L\, d^2q(t)/dt + R\, dq(t)/dt + q(t)/C = V_m \sin \omega t$

ii) The energy stored in each of L and C is given as

$Uc = 1/2C\omega^2[Vm^2/R^2+(XC - Xl)^2] \cos^2 (\omega to + \phi)$

iii) For the circuit to become LC oscillator, R needs to be short-circuited. By doing so, the capacitor will continue to discharge and all the energy will be transferred to L and back and forth. This way there will be an oscillation of energy from electrostatic to magnetic.