Class 12 : Application of Differential Equations- LRC Circuits

1. Determine Q and I in an LRC circuit with L = 0. 05 H, R = 20 Ohms, C = 100 micro Farad given that Q = 0 , i = 0 at t = 0.

Answer: $Q = e^{-200t}(0.01cos400t - 0005sin400t) + 0.01,\ I = 5e^{-220t}sin400t$

2. Find Q and I in the LRC circuit with L=2, R = 4, C = 0.05 , E = 100 and Q(0) = Q'(0) =0.

Answer : $Q(t) = 5 - \frac{5}{3}e^{-t}(3cos3t + sin3t)\ and\ I(t) = \frac{5}{3}e^{-t}(3cos3t + sin3t)$

3. At t=0, a current of 2 amperes flows in an RLC circuit with resistance R=40 ohms, inductance L = 0.2 henrys and capacitance C=10^{-5} Farads. Find the current flowing in the circuit at t > 0 if the initial charge on the capacitor is 1 coulomb.

Answer : $i = e^{-100t}\ (\ 2\cos 200\ t - 251 \sin 200\ t\ )$

4. A simple LR circuit is governed by the differential equation $L\ \frac{di}{dt} + \ Ri = 0$ where $i(t)$ is the current at any time t. If the resistance o the resistor is 2 ohms and the inductance of the inductor is 3 Henry find the current at t = 2 seconds given that the current at time t = 0 is 1 ampere.

Answer : $i(t) = \ e^{\frac{-2t}{3}}$ in general . $i(2) = e^{-\frac{4}{3}}$ amperes.

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