

Given

$$L = 3H$$

$$C = 27 \times 10^4 F$$

$$Q(0) = 5 \times 10^{-1} C$$

$$Q'(0) = 0$$

Diff Equation:

$$L \frac{d^2 Q}{dt^2} + \frac{1}{C} Q = 0$$

$$LQ'' + \frac{1}{C} Q = 0$$

$$3Q'' + \frac{10^4}{.037} Q = 0$$

$$\Rightarrow 3r^2 + 0r + 270000 = 0$$

$$\Rightarrow r^2 + 90000 = 0$$

$$r = 300i, -300i$$

General Solution:

$$Q(t) = C_1 \cos(300t) + C_2 \overset{\text{Sin}}{\cos}(300t)$$

$$Q(0) = 5 \times 10^{-1} \text{ C}$$

$$\therefore 5 \times 10^{-1} = C_1 \cos(0) + C_2 \sin(0)$$

$$5 \times 10^{-1} = C_1$$

$$Q'(t) = -300 C_1 \sin(300t) + 300 C_2 \cos(300t)$$

$$0 = C_1 \sin(0) + C_2 \cos(0)$$

$$0 = C_2$$

$$\therefore Q(t) = 5 \times 10^{-1} \cos(300t)$$