Integrals applied

1)
$$q = \int i \, dt$$

$$v_c = (1/C) \int i \, dt$$

3)
$$w = \int p \, dt$$

4)
$$\Phi = (-1/N) \int v_{ind} dt$$

5)
$$i = (-1/L) \int v_{ind} dt$$

6)
$$i_1 = (-1/M) \int v_2 dt$$

Kirchoff's Laws Applied:

7) The current Law.

The sum of the currents toward any point in a circuit ant any instant equals zero.

$$i_g = C \frac{dv}{dt} + (v/R) - (1/L) \int v \, dt$$

8) The voltage Law.

The sum of the voltage drops around a circuit, at any instant, equals zero.

$$v_g = -L \frac{di}{dt} + Ri + (1/C) \int i \, dt$$

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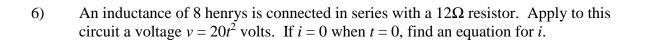
The current in a circuit was $i = 4t^3$ amps. How many coulombs were transmitted in 3 seconds?

2) An 80 μ f capacitor is charged to 100 volts. We then apply a current $i_c = 0.04t^3$ amps in the same polarity as the initial charge. After how many seconds will the capacitor voltage reach 225 volts?

The voltage applied to a circuit was v = 2t + 1 volts. If the current followed the equation i = 0.03t amperes, find the energy w delivered from t = 0 to t = 50 seconds.

4) A 110 turn winding carries a flux of 0.8 weber. If we now want to vary the flux so that a voltage $v_{ind} = -5t^2$ volts appears in the winding, what equation must the flux through the winding follow?

A DC current of 0.3 ampere flows in a 15 henry inductor. Superimposed on this DC is a varying current such that the voltage $v_{ind} = 120t^{1/3}$ volts appears in the inductor. Find the instantaneous total current when t = 1 second (Assume that the DC and AC currents have the same polarity when t = 1 second).

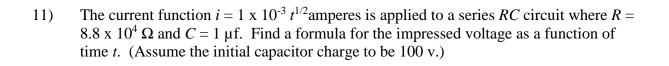


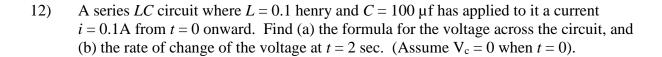
If we apply a voltage
$$v = 90t^{1/2}$$
 to a circuit consisting of a 30 henry inductance shunted by a 50 ohm resistance, what current flows when $t = 4$ seconds? (Let $i = 0$ when $t = 0$).

8) If we apply a voltage $v = 20t^4$ volts across a parallel *RL* combination, where $R = 500\Omega$ and L = 40 henrys, find the total current when t = 0.2 seconds. Let $i = 4\mu$ A when t = 0.

9) In a parallel RL circuit, $R = 5\Omega$ and L = 0.2 henrys. If a voltage $v = t^{3/2} + 2$ volts were applied, what would the current i be when t = 4 seconds? Assume i = 0.4 amps when t = 0.

10) A current $i = 0.005t^{1/2}$ amps flows in a parallel RC circuit where $R = 8.8 \times 10^4 \Omega$ and $C = 1 \mu f$. Find a formula for the voltage across the circuit as a function of time t. Assume the capacitor to be initially discharged.





A series circuit has these constants: R = 5kΩ, L = 200 henrys, and C = 20 μf. If we supply to the circuit a current $i = 0.02t^2$ amperes, at what rate does the voltage across the circuit change when t = 0.2 seconds?

In a series RCL circuit, let $R = 10\Omega$, $C = 10,000\mu$ f, and L = 10 henrys. Through this circuit we pass a current $i = 1 - t^{1/2}$ amps. Find the total voltage v across this circuit when t = 4 seconds. Assume v = 0.25 volts when t = 1 second.