1. A 1 V d.c voltage source is connected to a series $R-L-C$ with $R = 3\,\Omega$, $L = 1$H and $C = \frac{1}{2}$ F at $t = 0$. Obtain the voltage across the capacitor $v(t)$ and the current $i(t)$ in the circuit for $t \geq 0$. Assume the initial conditions to be relaxed.

2. An 1 A d.c current sourcee is connected across the parralel combination of $R = \frac{1}{8}\,\Omega$, $L = \frac{1}{8}$H and $C = 2$ F at $t = 0$. Obtain the voltage across the capacitor $v(t)$ and the current $i(t)$ through the inductor for $t \geq 0$. Assume the initial conditions to be relaxed.

3. A system is described by the following differential equation

$$\frac{d^2y}{dt^2} + 4y = x(t) \text{ with boundary conditions: } y(0^-) = 2 \text{ and } \frac{dy}{dt}(0^-) = 1$$

If $x(t) = \delta(t)$, find out the following

(i) Find out the values of $y(0^+)$ and $\frac{dy}{dt}(0^+)$

(ii) Solve for $y(t)$ for $t \geq 0^+$.

(iii) Sketch $y(t)$ indicating important time values and amplitude values.

For solving this problem, be in time domain (i.e., don't use any transformation).

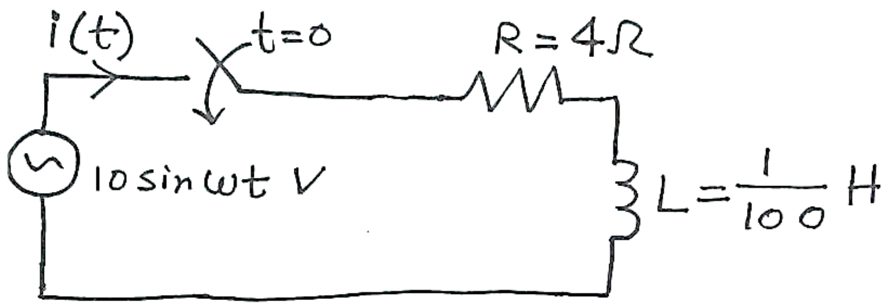
4. A system is described by the following differential equation $\frac{dy}{dt} + 4y = t$ with boundary condition $y(0) = 2$. Find the solution to this differential equation.

5. A system is described by the following differential equation $\frac{d^2y}{dt^2} + 5\frac{dy}{dt} + 6y = 1 + 2t + 3t^2$ with boundary condition $y(0) = 1$ and $\frac{dy}{dt}(0) = 2$. Find the solution to this differential equation.

6. A system is described by the following differential equation $\frac{d^2y}{dt^2} + 5\frac{dy}{dt} + 6y = 2e^{-5t}$ with boundary condition $y(0) = 1$ and $\frac{dy}{dt}(0) = 2$. Find the solution to this differential equation.

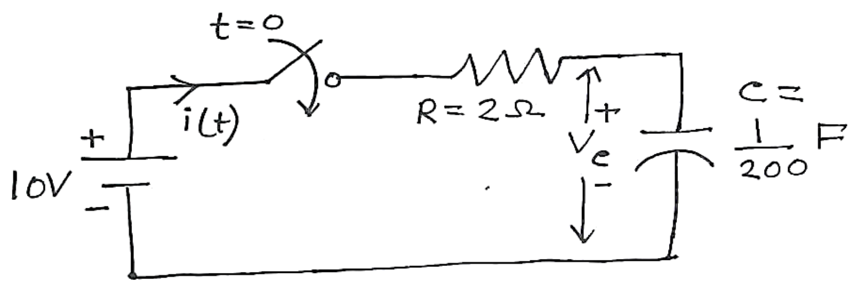
7. A system is described by the following differential equation $\frac{dy}{dt} + 5y = 2e^{-5t}$ with boundary condition $y(0) = 1$. Find the solution to this differential equation.

8.



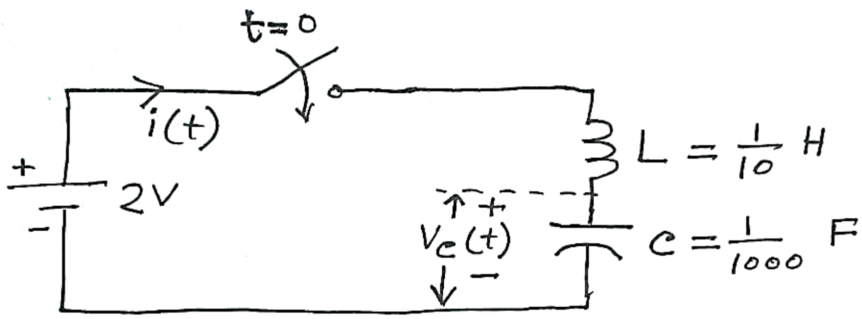
Find the expression of current $i(t)$ for $t > 0$ if the switch is closed at $t = 0$ and $\omega = 300$ radian/sec.

9.



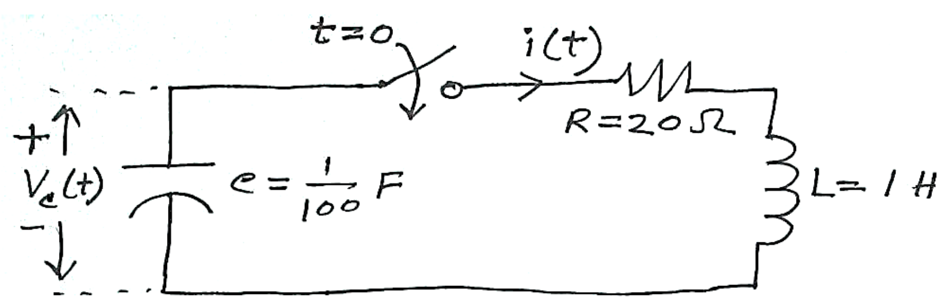
Find the expression of current $i(t)$ for $t > 0$ if the switch is closed at $t = 0$. The capacitor was initially uncharged.

10.



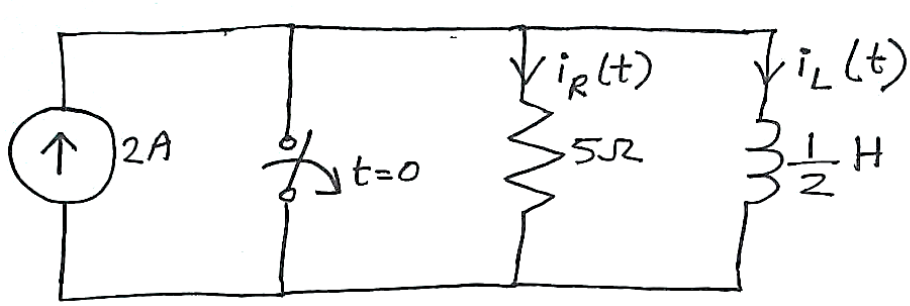
Find the expression of capacitor voltage $v_c(t)$ for $t > 0$ if the switch is closed at $t = 0$. The capacitor was initially uncharged.

11.



Find the expression of current $i(t)$ for $t > 0$ if the switch is closed at $t = 0$. The initial capacitor voltage $v_c(0)$ =1 V.

12.



Find the expression of currents $i_R(t)$ and$i_L(t)$ for $t > 0$ if the switch is **<u>opened (disconnected)</u>** at $t = 0$ and the initial current through the inductor was zero.