

# **NETWORK ANALYSIS AND SYNTHESIS**

# Unit – III

## Transient Circuit Analysis

- Natural response and forced response,
- Transient response and steady state response for arbitrary inputs (DC and AC),
- Evaluation of time response both through classical and Laplace methods.

# Why there is a transient response?

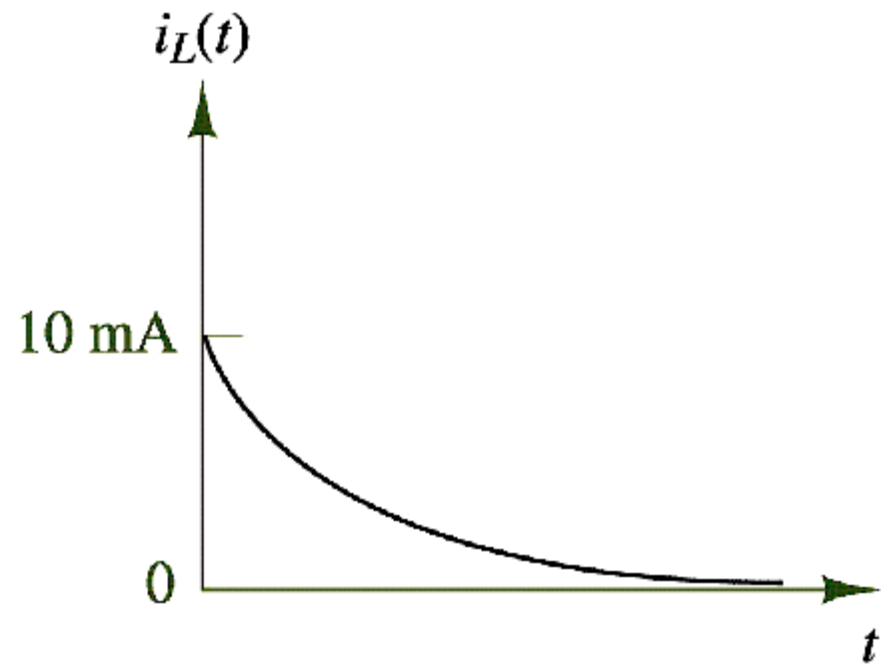
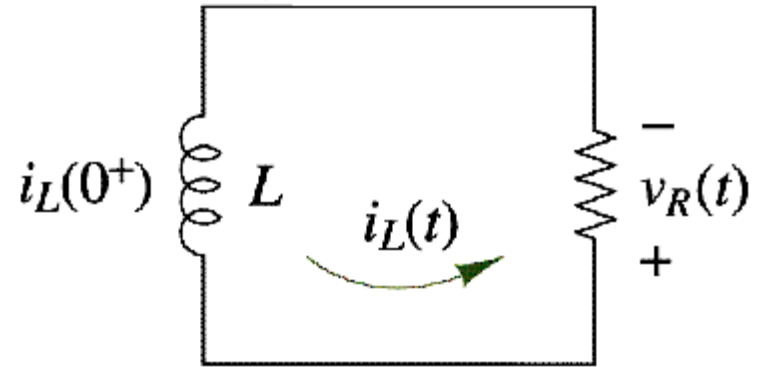
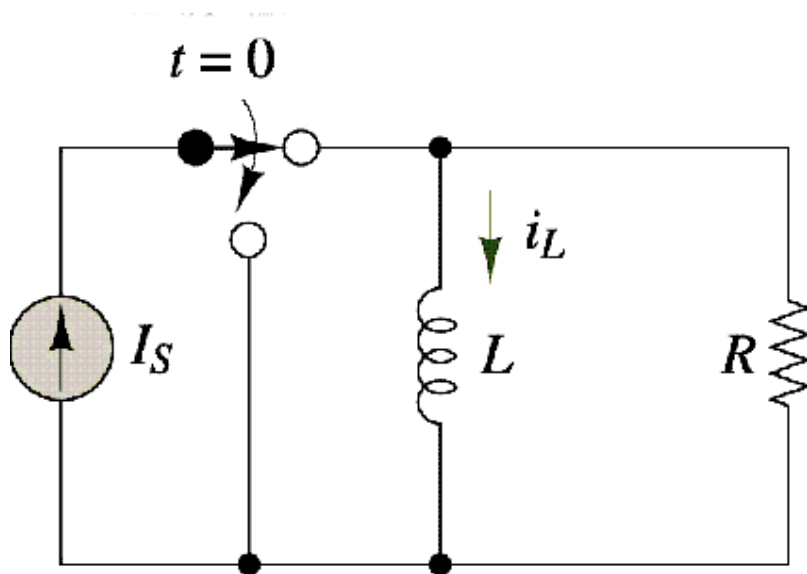
- The voltage across a capacitor cannot be changed instantaneously.

$$V_C(0^-) = V_C(0^+)$$

- The current across an inductor cannot be changed instantaneously.

$$I_L(0^-) = I_L(0^+)$$

# Example



# Transients Analysis

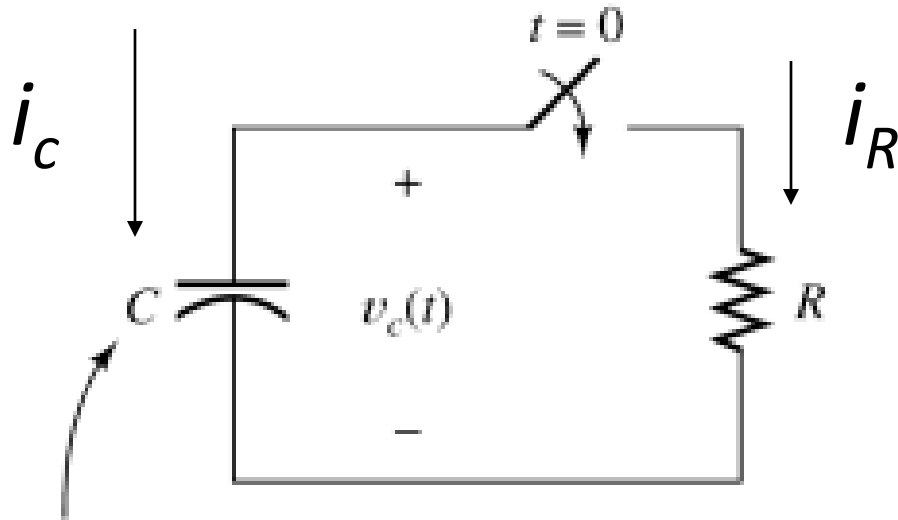
1. Solve first-order  $RC$  or  $RL$  circuits.
2. Understand the concepts of transient response and steady-state response.
3. Relate the transient response of first-order circuits to the time constant.

# Transients

The solution of the differential equation represents are response of the circuit. It is called *natural response*.

The response must eventually die out, and therefore referred to as *transient response*.  
(source free response)

# Discharge of a Capacitance through a Resistance



Capacitance charged to  $V_i$   
prior to  $t = 0$

$$\sum i = 0, \quad i_C + i_R = 0$$

$$C \frac{dv_c(t)}{dt} + \frac{v_c(t)}{R} = 0$$

Solving the above equation  
with the initial condition  
 $v_c(0) = V_i$

**THANKS....**

Queries Please...