

Lecture 13, Tuesday, February 8, 2022

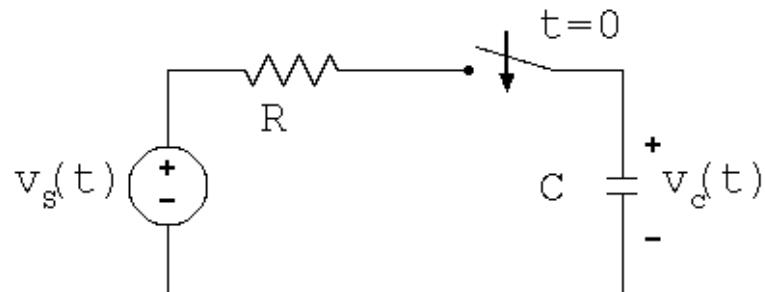
- *Time-invariance:* delayed inputs cause equally delayed outputs for zero initial state and any delay t_d . So, if

$$\mathbf{f}_1(t) \rightarrow \boxed{\text{time-invariant}} \rightarrow \mathbf{y}_1(t), \text{ then}$$

$$\mathbf{f}_2(t) = \mathbf{f}_1(t - t_d) \rightarrow \boxed{\text{time-invariant}} \rightarrow \mathbf{y}_2(t) = \mathbf{y}_1(t - t_d),$$

- Basically, the output shouldn't change significantly if you turn on your input earlier/later, you should see the same output, just earlier/later.
- A shift in the input creates the same shift in the output

- First order RC circuits



– For $t > 0$

$$\Rightarrow \frac{v_s(t)}{RC} = \frac{dv_c(t)}{dt} + \frac{1}{RC}v_c(t)$$

– First order ordinary differential equation (ODE) with constant coefficients

- First order ODE with constant coefficients and constant input:

$$K = \frac{dy(t)}{dt} + ay(t) \quad \text{for } t > 0$$