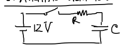
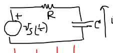
* Analisis Transient



saklar ditutup pada $t=0$

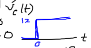
$v_c(0) = 0$

Tentukan $v_c(t), t \geq 0$!



$v_s(t) \to \boxed{g(t)} \to v_c(t)$

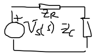
$v_s(t) \begin{cases} = 0, & t < 0 \\ = 12, & t \geq 0 \end{cases}$



Transf. Laplace

$V_s(s) = \mathcal{L}\, v_s(t) = 12\, \mathcal{L}\, u(t) = \frac{12}{s}$

(bans 2, Table 4.1, hal. 60)



$V_c(s) = \frac{Z_c}{Z_R + Z_c} V_s(s) = \frac{1/Cs}{R + 1/Cs} V_s(s)$

$= \frac{1}{RCs+1} V_s(s)$

$G(s) = \frac{V_c(s)}{V_s(s)} = \frac{1}{RCs+1}$

$V_s(s) \to \boxed{G(s)} \to V_c(s)$

$V_c(s) = G(s) \cdot V_s(s)$

$= \frac{1}{RCs+1} \cdot \frac{12}{s}$

$= \frac{12}{s(RCs+1)} = \frac{12}{RCs\left(s+\frac{1}{RC}\right)}$

$t \geq 0$.

$v_c(t) = \frac{12}{RC} \mathcal{L}^{-1} \left(\frac{1}{s\left(s+\frac{1}{RC}\right)} \right)$

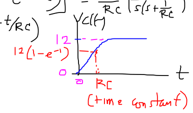
$= \frac{12}{RC} \left(\frac{1}{s\left(s+\frac{1}{RC}\right)} \right)$

bans 7 Tabel Appendix hal. 361

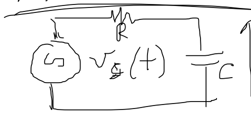
$\frac{1}{s(s+a)}, \; a = \frac{1}{RC}$

$= \frac{12}{\cancel{RC}} \left[\cancel{RC} \left(1 - e^{-t/RC}\right) \right]$

$= 12\left(1 - e^{-t/RC}\right)$



* Analisis Steady state



Diketahui:

$v_s(t) = 12 \sin \omega t$

Tentukan $v_c(t)$, utk $t >>> 0$

$V_s(s) \to \boxed{G(s)} \to V_c(s)$

$G(s) = \frac{V_c(s)}{V_s(s)} = \frac{1}{RCs+1}$

$s = j\omega \rightarrow j = \sqrt{-1}$

$\omega = 2\pi f$, $f = \frac{1}{T}$ [Hertz]

T = periode [second]

$V_s(j\omega) \to \boxed{G(j\omega)} \to V_c(j\omega)$

$v_s(t) = A_1 \sin \omega t$

$v_c(t) = A_2 \sin(\omega t + \phi)$

$\frac{A_2}{A_1} = |G(j\omega)|$ $\quad \phi = \angle G(j\omega)$

$G(j\omega) = \frac{1}{j\omega RC+1} \rightarrow \frac{A_2}{A_1} = |G(j\omega)|$

Spektrum

GAIN $= \left| \frac{1}{j\omega RC+1} \right|$

$= \frac{1}{\sqrt{\omega^2 R^2 C^2 + 1}}$

$\angle G(j\omega) = \angle \frac{1}{j\omega RC+1}$ PHASE

$\phi = -\tan^{-1} \omega RC$

$v_c(t) = A_2 \sin(\omega t + \phi)$

$A_2 = \frac{1}{\sqrt{\omega^2 R^2 C^2 + 1}} A_1$

$= \frac{12}{\sqrt{\omega^2 R^2 C^2 + 1}}$

$\phi = -\tan^{-1} \omega RC$

(LOW PASS FILTER)

$\omega \to 0 \longrightarrow A_2 \approx 12, \; \phi \approx 0$

$\omega \to \infty \longrightarrow A_2 \approx 0, \; \phi = -90°$

(lagging)