Tugas Rumah 7

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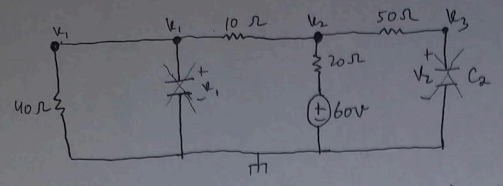
1.



sumber tegangan DC 60 V
↳ kapasitor dianggap open circuit

·) kcl di V_1

$$\frac{V_1-0}{40}+\frac{V_1-V_2}{10}=0 \quad |\times 40$$

$$5V_1-4V_2=0 \ldots (1)$$

·) kcl di V_3

$$\frac{V_3-V_2}{50}=0$$

$$V_3=V_2 \ldots (3)$$

subs ke (2)

·) kcl di V_2

$$\frac{V_2-V_1}{10}+\frac{V_2-60}{20}+\frac{V_2-V_3}{50}=0 \quad |\times 100$$

$$-10V_1+17V_2-2V_3=300 \ldots (2)$$

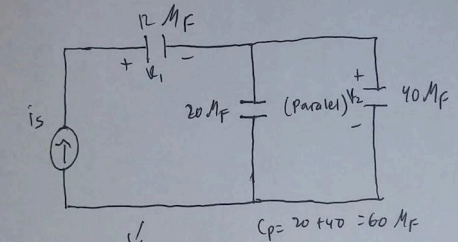
$$-10V_1+15V_2=300 \ldots (4)$$

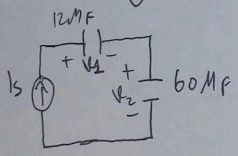
eliminasi pers (1) & (4)

Paralel C_{V_3} & V_2 = 300/7 Volt //

V_1 = 240/7 Volt //

2.





$i_s = 50.e^{-2t}$ mA

$V_1(0) = 50$ V

$V_2(0) = 20$ V

a.) $V_1 = \frac{Q}{C} = \frac{1}{C}\int i_s\,dt$

$= \frac{1}{C}\int 50.e^{-2t}.10^{-3}\,dt$

$= \frac{1}{C}\left(-25e^{-2t}+k\right).10^{-3}$

$V_1(0) = \frac{1}{C}(-25+k)10^{-3}$

$50 = \frac{1}{12.10^{-6}}(-25+k).10^{-3}$

$k = 25,6$

$\therefore V_1(t) = \frac{1000}{12}(-25.e^{-2t}+25,6)$ V //

·) $V_2 = \frac{1}{C}\int i_s\,dt$

$= \frac{1}{C}\left(-25.e^{-2t}+k\right).10^{-3}$

$20 = \frac{1}{60.10^{-6}}10^{-3}(-25+k)$

$k = 26,2$

$\therefore V_2(t) = \frac{1000}{60}(-25.e^{-2t}+26,2)$ V //

b.)) $U_1(0,5) = \frac{1}{2} C_1 . V_1^2$

$= \frac{1}{2} \cdot 12.10^{-6} \left(\frac{1000}{12} (-25.e^{-2t} + 25,6) \right)^2$

$= \frac{1}{24} . (-25e^{-2(0,5)} + 25,6)^2 = \frac{1}{24} \left(\frac{-25}{e} + 25,6 \right)^2$ J //

) $U_2(0,5) = \frac{1}{2} C_2 . V_2^2$ $\quad V_2 = V_3$ (Paralel)

$= \frac{1}{2} 20.10^{-6} \left((-25.e^{-2t} + 26,2) . \frac{1000}{60} \right)^2$

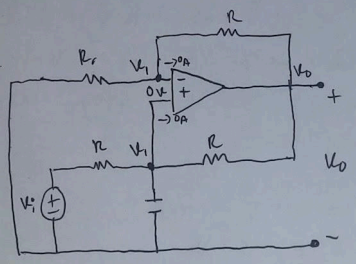
$= \frac{1}{360} (-25.e^{-2(0,5)} + 26,2)^2 = \frac{1}{360} \left(\frac{-25}{e} + 26,2 \right)^2$ J //

) $U_3(0,5) = \frac{1}{2} C_3 . V_2^2$

$= \frac{1}{2} . 40.10^{-6} \left((-25.e^{-2t} + 26,2) . \frac{1000}{60} \right)^2$

$= \frac{1}{180} (-25.e^{-2(0,5)} + 26,2)^2 = \frac{1}{180} \left(\frac{-25}{e} + 26,2 \right)^2$ J //

3.



) kel atas

$\frac{V_1 - 0}{R} + \frac{V_1 - V_0}{R} = 0$

$2V_1 - V_0 = 0$

$V_1 = \frac{1}{2} V_0$ ..(1)→

$I = \frac{Q}{t} = \frac{C.V}{t}$

) kel bawah

$\frac{V_2 - V_i}{R} + \frac{V_2 - V_0}{R} + I = 0$

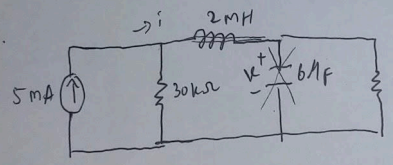
$\frac{2V_1}{R} - \frac{V_0}{R} + C.\frac{dv_0}{dt} = \frac{V_i}{R}$

$\int \frac{C}{2} . \frac{dv_0}{dt} = \int \frac{V_i}{R}$

$V_0 = \oplus \frac{2}{CR} \int V_i . dt$ //

(positif = non-inverting)

4.

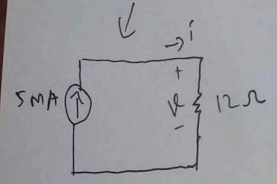


$i_L = ?$

$i_C = ?$

karena DC → arus konstan → $V = 0$ (kapasitor open circuit)

$V_{induktor} = \frac{dI}{dt} . L$ ($V = 0$, maka induktor short circuit)



$30 \parallel 20 = \frac{30.20}{30+20} = 12\Omega$

$V = I.R$

$= 5.10^{-3} . 12$

$V_{tot} = 6.10^{-2}$ Volt

) $i_L = \frac{V}{L} = \frac{6.10^{-2}}{2.10^{-3}} = 30$ A //

) $V_{tot} = V_C = 6.10^{-2}$ Volt (karena Paralel)