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fululul

Ödev 5
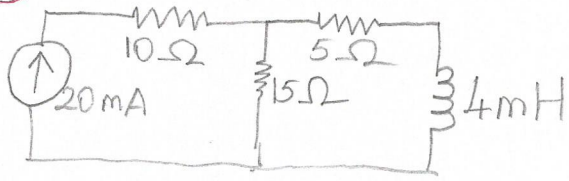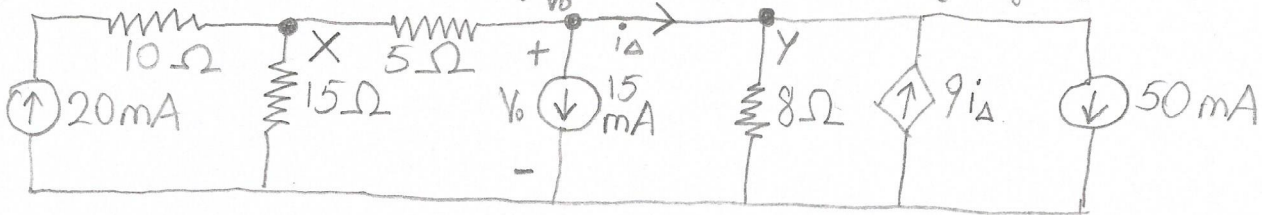
①

$5\Omega // 15\Omega$
Akım, ters orantılı dağılır.
$5 \cdot 3i_o = 15 \cdot i_o \rightarrow i_o = 5mA$
$4i_o = 20mA \rfloor \ 3i_o = i_L = 15mA \ (\text{yön} \downarrow)$
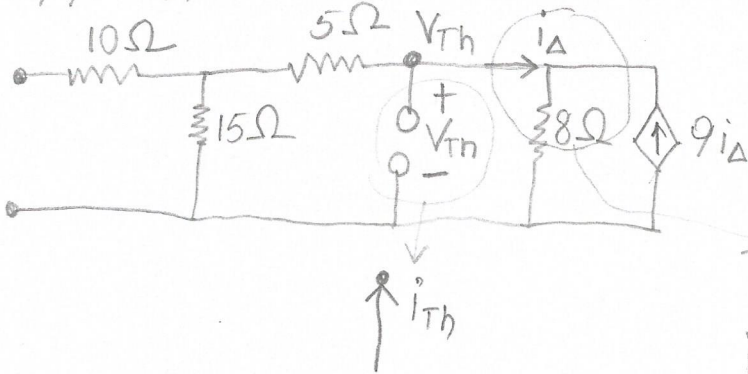
Anahtar t=0'da kapandığında, bobin akım kaynağı gibi davranır.

$$-20 \cdot 10^{-3} + \frac{V_x}{15} + \frac{V_x - V_o(0^+)}{5} = 0 \quad (I) \rightarrow Node-X$$

$$\frac{V_o - V_x}{5} + 15 \cdot 10^{-3} + \frac{V_o^+}{8} - 9i_\Delta + 50 \cdot 10^{-3} = 0 \quad (II) \rightarrow Node-V_o$$

$$-i_\Delta + \frac{V_o^+}{8} - 9i_\Delta + 50 \cdot 10^{-3} = 0 \quad (III) \rightarrow Node-Y$$

$(I),(II),(III)$ çözülürse $V_o(0^+) = -80 \cdot 10^{-3}V = -80mV$

Voltajın V_{Th} olduğunu varsayarsak

$i_{Th} = \frac{V_{Th}}{20} + \frac{V_{Th}}{8} - 9i_\Delta$

$\frac{V_{Th}}{8} = i_\Delta + 9i_\Delta = 10i_\Delta$
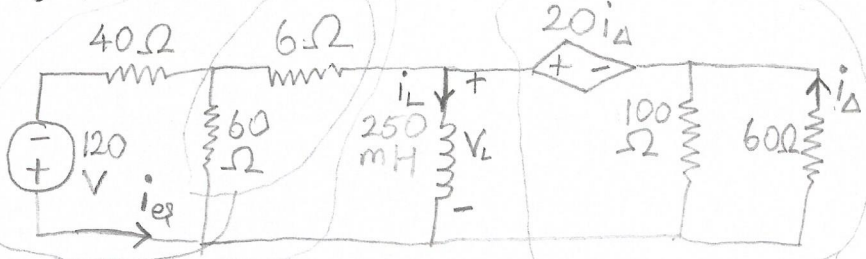
$i_\Delta = \frac{V_{Th}}{80}$

$\longrightarrow i_{Th} = \frac{V_{Th}}{20} + \frac{V_{Th}}{8} - \frac{9V_{Th}}{80} = \frac{5V_{Th}}{80} \rightsquigarrow = \frac{V_{Th}}{16}$

$R_{Th} = \frac{V_{Th}}{V_{Th}/16} = 16\Omega \quad \tau = \frac{4 \cdot 10^{-3}}{16} = \frac{1}{4000}s \quad V_o(\infty) = 0 \rightarrow$ Düz tel gibi davranır.

$$V_o(t) = 0 + (-80-0) \cdot e^{-t/\frac{1}{4000}} = -80e^{-4000t}mV$$

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Soru4

②

$\leftarrow$ $t<0$ iken bobin kısa devre olduğundan devre dışı.

$\rightarrow 60\,\Omega\,//\,6\,\Omega \rightarrow R_{eş} = 5{,}45\,\Omega + \underbrace{40\,\Omega}_{\text{Paralellere seri}} = 45{,}5\,\Omega$ $i_{eş} = \frac{120}{45{,}5} = 2{,}64\,A \rightarrow$

$\rightarrow 60\,\Omega$'dan i geçerse, $6\,\Omega$'dan $10i$ geçer. $\rightarrow 11i_s = 2{,}64\,A$, $i_s = 0{,}24\,A \rightarrow$

$\underline{i_L(0) = -10i_s = -2{,}4\,A}$

$\rightarrow t=0$'da anahtar açıldığında istenen değerlere etkisi olmaz.

$\hookrightarrow$
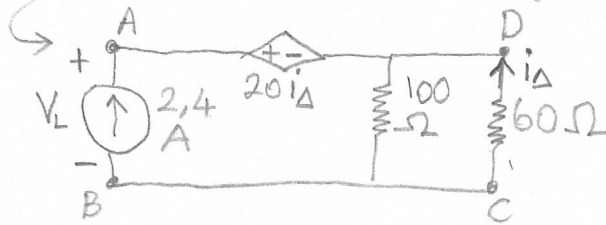
$\dfrac{100\,\Omega\,//\,60\,\Omega}{\underset{3i_b}{\underbrace{}}\;\underset{5i_b}{\underbrace{}}} \rightarrow 8i_b = 2{,}4 \quad i_b = 0{,}3\,A$

$\underline{i_\Delta(0^+) = -5i_b = -1{,}5\,A}$

ABCD Mesh $\rightarrow V_L + 60i_\Delta - 20i_\Delta = 0 \rightarrow \underline{V_L(0^+) = -40i_\Delta = 60\,V}$

R_{Th} için, $V_{AB} = V_{Th}$ olsun.
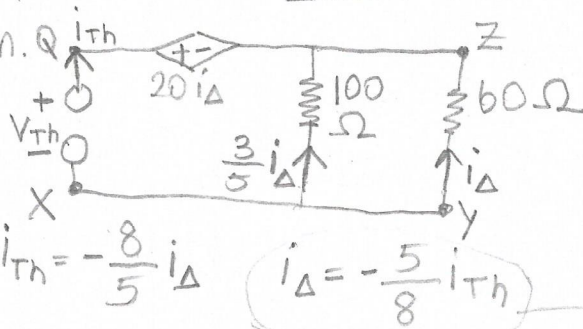
$i_{Th} + \frac{3}{5}i_\Delta + i_\Delta = 0 \rightarrow i_{Th} = -\frac{8}{5}i_\Delta \quad \boxed{i_\Delta = -\frac{5}{8}i_{Th}}$

QXYZ Mesh $\rightarrow V_{Th} + 60i_\Delta - 20i_\Delta = 0 \rightarrow V_{Th} = -40i_\Delta = -40 \cdot \left(-\frac{5}{8}\right)i_{Th} = 25i_{Th} \rightarrow$

$\rightarrow \dfrac{V_{Th}}{i_{Th}} = R_{Th} = 25\,\Omega \quad \mathcal{J} = \dfrac{250 \cdot 10^{-3}}{25} = 10^{-2}\,s$

$*\begin{pmatrix} i_L(\infty)=0 \\ V_L(\infty)=0 \\ i_\Delta(\infty)=0 \end{pmatrix} \rightarrow$ Sonsuzda bobinin yükü boşalır. Dolayısıyla hepsi 0.

a-) $i_L(t) = 0 + [-2{,}4 - 0]e^{-t/\frac{1}{100}} = -2{,}4 \cdot e^{-100t}\,A$

b-) $V_L(t) = 0 + [60 - 0]e^{-t/\frac{1}{100}} = 60e^{-100t}\,V$

c-) $i_\Delta(t) = 0 + [-1{,}5 - 0]e^{-t/\frac{1}{100}} = -1{,}5e^{-100t}\,A$

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