trabalho 1

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a) done

b) done

c) $\frac{2\pi}{3} \Rightarrow \frac{2\pi}{3} \times \frac{0{,}02}{2\pi} \cong 6{,}67\,ms$

$V_c = \sqrt{2} \cdot \sqrt{3} \cdot 120 = 293{,}94$

d) $V_{av} = \frac{1}{\pi} \times \int_0^{\pi} V(\theta)\, d(\theta)$; $A = \sqrt{2} \cdot 120$

$= \frac{1}{\pi} \left[\int_0^{\frac{\pi}{6}} A \cdot \sin(\theta - \frac{4\pi}{3}) + \int_{\frac{\pi}{6}}^{\frac{5\pi}{6}} A \cdot \sin(\theta) + \int_{\frac{5\pi}{6}}^{\frac{3\pi}{2}} A \cdot \sin(\theta - \frac{2\pi}{3}) + \int_{\frac{3\pi}{2}}^{2\pi} A \cdot \sin(\theta - \frac{4\pi}{3}) \right]$

$$\boxed{V_{av} = 3 \times \frac{1}{\pi} \times \int_{\frac{\pi}{6}}^{\frac{5\pi}{6}} A \cdot \sin(\theta)} = 140{,}3454\ [V]$$

$V_{rms} = \sqrt{\frac{1}{\pi}} \times \sqrt{\int_0^{\pi} (V_{(\theta)})^2\, d\theta}$; $A = \sqrt{2} \cdot 120$

$= \sqrt{\frac{1}{\pi}} \times \sqrt{\int_0^{\frac{\pi}{6}} (A \cdot \sin(\theta - \frac{4}{3}))^2 + \int_{\frac{\pi}{6}}^{\frac{5\pi}{6}} (A \sin(\theta))^2 + \int_{\frac{5\pi}{6}}^{\frac{3\pi}{2}} (A \sin(\theta - \frac{2\pi}{3}))^2 + \int_{\frac{3\pi}{2}}^{2\pi} (A \cdot \sin(\theta - \frac{4\pi}{3}))^2}$

$\cong 142{,}668\ [V]$

c.a) $\sqrt{127890{,}1659} \cong 357{,}617$

$\sqrt{\frac{1}{2\pi}} \times 357{,}617 = 142{,}668\ [V]$

V

$20354{,}35207$

$\sqrt{20354{,}35207} = 142{,}668\,[V]$

$$\boxed{V_{rms} = \sqrt{3 \times \frac{1}{\pi} \times \int_{\frac{\pi}{6}}^{\frac{5\pi}{6}} (A \cdot \sin(\theta))^2\, d\theta}}$$

$= 142{,}668679$

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e) como se trata de uma carga puramente Resistiva $R = 500\,\Omega$ $Z = 500\,\Omega \angle 0$

$$A = \frac{\sqrt{2}\,120}{500} = 0{,}339411 \quad ; \quad T = 2\pi$$

$$\boxed{I_{0\,av} = 3 \times \frac{1}{T} \times \int_{\frac{\pi}{6}}^{\frac{5\pi}{6}} A \cdot \sin(\theta)\, d\theta}$$

$$= 0{,}28069$$

$$\boxed{I_{0\,rms} = \sqrt{3 \times \frac{1}{T} \times \int_{\frac{\pi}{6}}^{\frac{5\pi}{6}} (A \cdot \sin(\theta))^2\, d\theta}}$$

$$= 0{,}28533$$

Numa das fases

$$\boxed{I_{1\,av} = \frac{1}{T} \int_{\frac{\pi}{6}}^{\frac{5\pi}{6}} A \cdot \sin(\theta)\, d\theta}$$

$$= \frac{I_{0\,AV}}{3} = 0{,}09356$$

$$\boxed{I_{1\,rms} = \sqrt{\frac{1}{T} \int_{\frac{\pi}{6}}^{\frac{5\pi}{6}} (A \cdot \sin(\theta))^2\, d\theta}}$$

$$= 0{,}164739$$

f)

$$S_1 = U_{1\,rms} \times I_{1\,rms}$$

$$\cancel{= \sqrt{\frac{1}{T} \times \int_{\frac{\pi}{6}}^{\frac{5\pi}{6}} (\sqrt{2}\,120 \sin(\theta))^2\, d\theta} = 82{,}3698} \times 0{,}164739$$

$$= 120 \times 0{,}164739 = 19{,}768 \,[VA]$$

$$P_1 = \frac{1}{T} \int_0^T V_1(\theta) \cdot I_1(\theta)\, dt = \frac{1}{T} \int_{\frac{\pi}{6}}^{\frac{5\pi}{6}} \sqrt{2}\,120 \sin(\theta) \times \frac{\sqrt{2}\,120}{500} \sin(\theta)$$

$$= 13{,}5695$$

$$PF = \frac{P_1}{S_1} \simeq 0{,}686437$$

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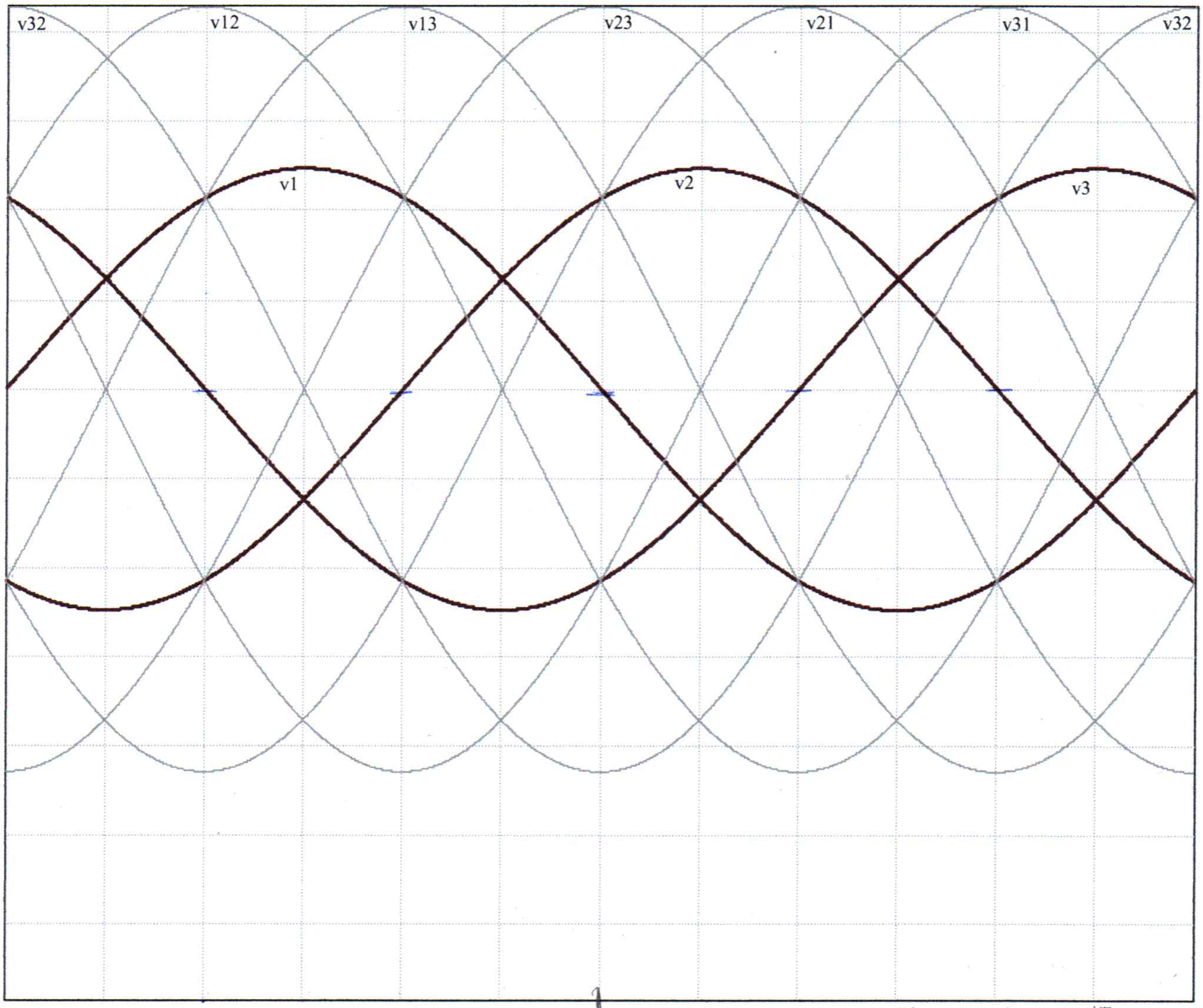

$\frac{\pi}{6}$ $\frac{\pi}{3}$ $\frac{\pi}{2}$ $\frac{4\pi}{6}$ $\frac{5\pi}{6}$ π $\frac{7\pi}{6}$ $\frac{8\pi}{6} = \frac{4\pi}{3}$ $\frac{9\pi}{6} = \frac{3\pi}{2}$ $\frac{10\pi}{6} = \frac{5\pi}{3}$ $\frac{11\pi}{6}$ 2π

v_1

$\frac{4\pi}{6} = \frac{2\pi}{3}$

46,78 V

v_2

v_3

v_3

$$I_{D\_max} = I_o$$

$$I_{D\_médio} = \frac{1}{\pi}\int_0^{\pi} i_D(t)\,dt = \frac{1}{\pi}\int_0^{\frac{\pi}{3}} I_o\,dt = \frac{I_o}{3}$$

$$I_{D\text{-}rms} = \sqrt{\frac{1}{\pi}\int_0^{\pi} i_D^2(t)\,dt} = \sqrt{\frac{1}{\pi}\int_0^{\frac{\pi}{3}} I_o^2\,dt} = \frac{1}{\sqrt{\pi}} \times \frac{\sqrt{\pi}}{\sqrt{3}} I_o$$

$$= \frac{I_o}{\sqrt{3}}$$

$$V_{o\,max} = \sqrt{2}\,V_{rms}$$

$$V_{o\,min} = \frac{\sqrt{2}}{2}\,V_{rms}$$

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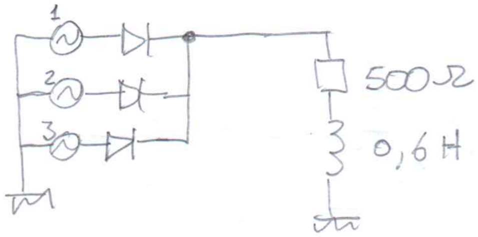
$V_{max} = \sqrt{2}\,120$



$X_L = 2\pi f L j$
$\cong 60\pi \cong 188,496$

$Z \cong 534,35 \measuredangle 20,66°$

regime permanente

I(θ)=0	time [sec]
0	0
2,9784	$9,43 \cdot 10^{-3}$
6,1201	0,0194
9,2616	0,0294

etc

$\alpha = \frac{\pi}{6}$

$I_o = \frac{V_{o\,médio} - E}{R}$
(⇒) RLE

i) tempo de condução:

$2,9784 \times \frac{0,02}{2\pi} = 9,48 \cdot 10^{-3}$

$\frac{2\pi}{3} \times \frac{0,02}{2\pi} = 6,67\,ms$ ∴ mais proxima fonte V maior

tensão inversa max:
$V_{inv\,max} = \sqrt{2} \cdot \sqrt{3} \cdot 120 = 293,938$ [V]

j) considerando como carga indutiva

$I_o = I_{o\,méd}$

$I_o = \frac{V_{méd}}{R}$
$= \frac{140,3454}{500}$
$\cong 0,2807$ [A]

Quanto mais indutivo a carga a corrente torna-se quase constante, não existindo interrupções na condução dos semicondutores.

P3

$$I_{D-max} = I_o$$

$$I_{D-médio} = \frac{1}{T} \int_0^T i_{D(t)}\, dt = \frac{1}{T} \int_0^{\frac{T}{3}} I_o\, dt = \frac{I_o}{3}$$

$$I_{D-rms} = \sqrt{\frac{1}{T} \int_0^T i_{D(t)}^2\, dt} = \sqrt{\frac{1}{T} \int_0^{\frac{T}{3}} I_o^2\, dt}$$

$$= \frac{1}{\sqrt{T}} \frac{\sqrt{T}}{\sqrt{3}} I_o = \frac{I_o}{\sqrt{3}}$$

$$P = \frac{1}{T} \int_0^T V_{o(t)}\, i_{o(t)}\, dt = I_o \frac{1}{T} \int_0^T V_{o(t)}\, dt = I_o V_{o-médio}$$

$$S = 3\, V_{s-rms} \times I_{s-rms} = 3\, V_{rms}\, I_{D-rms} = 3\, V_{rms} \frac{I_o}{\sqrt{3}}$$

$$FP_s = \frac{I_o \frac{3}{\pi} \sqrt{2}\, V_{rms} \sin\left(\frac{\pi}{3}\right)}{3\, V_{rms} \frac{I_o}{\sqrt{3}}} = \frac{\sqrt{6}}{\pi} \sin\left(\frac{\pi}{3}\right)$$

$$= 0{,}675$$