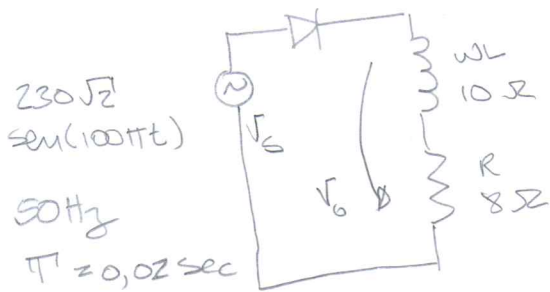


Exercício 1



$$X = 10 \Omega$$

$$Z = 12,80 \angle 51^\circ$$

$$\alpha < 0$$

a) $I(\theta) = 0 \rightarrow \theta = ?$

$$Z = \sqrt{10^2 + 8^2}$$

$$= 12,806 \Omega \angle 51,34^\circ$$

$$\text{solveN}\left(\left(\frac{E}{R} - \frac{E \sqrt{I_m}}{Z} \sin(\alpha - \phi)\right) \times e^{-\frac{R}{X} \theta} - \frac{E}{R} + \frac{\sqrt{I_m}}{Z} \sin(\theta + \alpha - \phi) = 0\right)$$

→ List

θ	t
0	0
4,0678	0,0129
7,9167	0,0228
10,321	0,0328
etc	

conduz desde 0 até 12,9ms

c) $t_i = 0 \quad t_f = 0,0129$

$$V_{\text{Media}} = \frac{1}{0,02} \int_0^{0,0129} (\sqrt{I_m} \sin(2\pi 50 \cdot t) - \frac{E}{R}) dt$$

$$= 82,874$$

$$V_{\text{Eficaz}} = \sqrt{\frac{1}{0,02} \times \int_0^{0,0129} (\sqrt{I_m} \sin(2\pi 50 t) - \frac{E}{R})^2 dt}$$

$$= 173,793$$

Exercício 1

continua

$$c) I_m = \frac{1}{2\pi} \int_0^{4,0678} I(\theta) d\theta = 10,35 \text{ A} \quad (\text{with } \phi = \frac{\pi}{2})$$

$$I_{rms} = \sqrt{\frac{1}{2\pi} \int_0^{4,0678} I^2(\theta) d\theta} = 15,00 \text{ A}$$

$$S = V_{in rms} \times I_{in rms} = 230 \times 15 = 3450 \text{ VA}$$

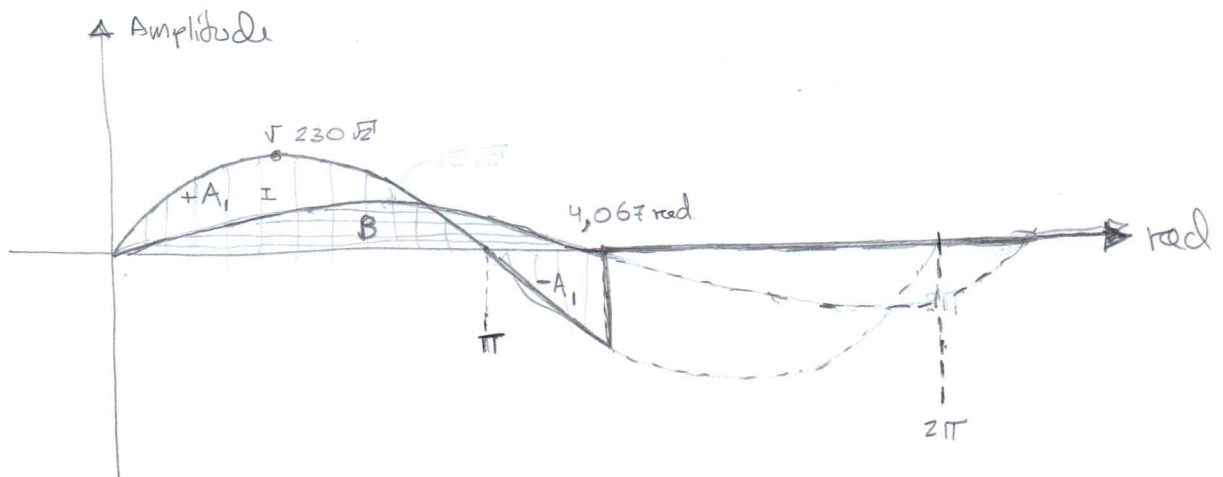
d)

$$P = \frac{1}{2\pi} \int_0^{4,0678} V_{in} \times I_{in} d\theta = 1801,39 \text{ W}$$

e)

$$PF = \frac{1801}{3450} = 0,522$$

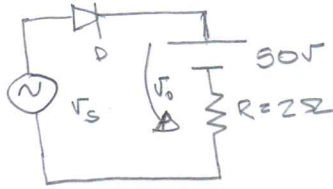
b)



Exercício 2

ELTRP

$$V_s(t) = 230\sqrt{2} \sin(100\pi t)$$



$$Z = 2 \angle 0^\circ$$

a)

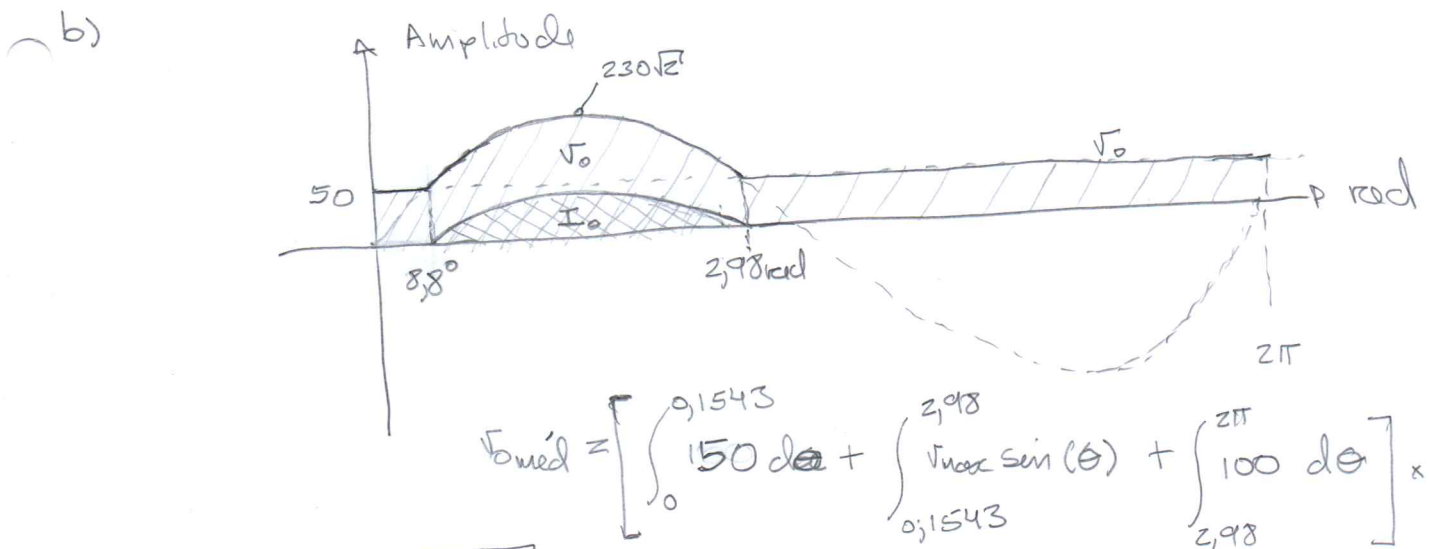
$$50 = 230\sqrt{2} \sin(\theta)$$

$$\theta = \arcsin\left(\frac{50}{230\sqrt{2}}\right)$$

$$= 0,1543 \text{ rad.}$$

$$0,1543 \times \left(\frac{0,01}{\pi}\right) = 4,912 \cdot 10^{-4} \text{ sec}$$

$$0,1543 \times \left(\frac{180}{\pi}\right) = 8,8407^\circ$$



c)

$I(\theta) = 0$	$\theta = ?$
0,1543	}
2,9872	
6,4375	}
9,2704	
12,72	

$$I_{med} = \frac{1}{2\pi} \int_{0,1543}^{2,9872} \frac{V_m}{|Z|} \sin(\theta + \alpha - \phi) - \frac{E}{R} d\theta$$

$$= 39,88 \text{ Amp}$$

$$I_{med} = \frac{1}{2\pi} \int_0^{2,9872-0,1543} \frac{V_m}{|Z|} \sin(\theta + \alpha - \phi) - \frac{E}{R} d\theta$$

$$= 39,2939 \text{ Amp.}$$

$$I_{eff} = \sqrt{\frac{1}{2\pi} \times \int_{0,1543}^{2,9872} \left(\frac{V_{max}}{|Z|} \sin(\theta + \alpha - \phi) - \frac{E}{R} \right)^2 d\theta}$$

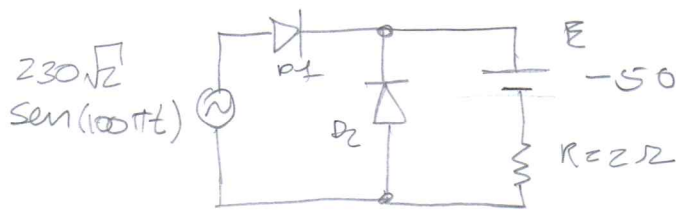
$$= 65,775 \text{ Amp}$$

d)

$$P_{med} = \frac{1}{2\pi} \int_{0,1543}^{2,9872} V_s \times \frac{V_{max}}{|Z|} \sin(\theta + \alpha - \phi) - \frac{E}{R} d\theta$$

$$= 10646,82 \text{ watt}$$

Exercício 3

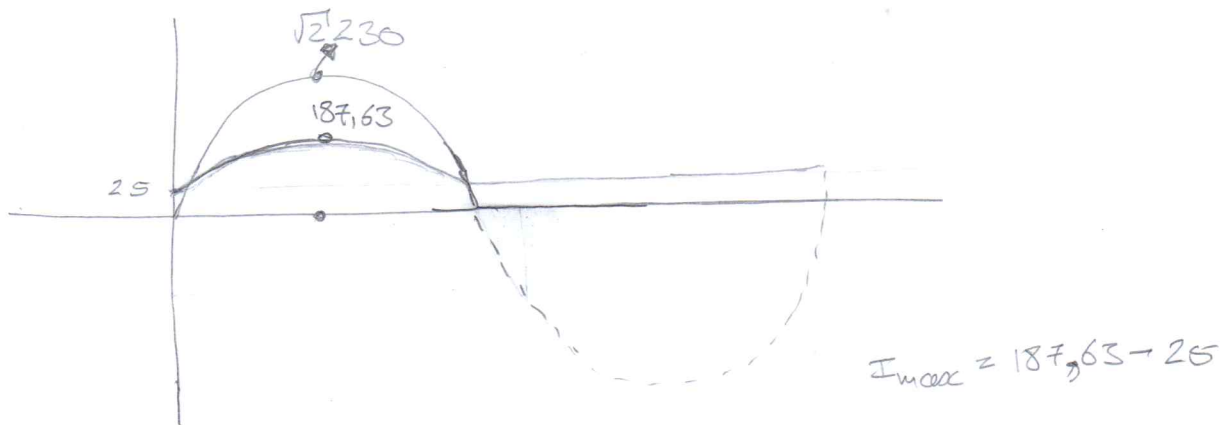


a)

$$v_s = 0 = 230\sqrt{2} \sin(\theta)$$

$$\Rightarrow \theta = 0^\circ$$

b)



c)

$$I_{med} = \frac{1}{\pi} \int_0^{\pi} 162,63 \sin(\theta) + 25 d\theta +$$

$$I_{med} = \frac{1}{\pi} \int_{\pi}^{2\pi} 25 d\theta = 76,76 \text{ A}$$

$$I_{ef} =$$

$$I_{c.c.} = \int_0^{\pi} (162,63 \sin(\theta) + 25)^2 d\theta = 59771,7286$$

$$\int_{\pi}^{2\pi} 25^2 d\theta = 1963,495408$$

$$\text{soma} = 61735,2241$$

$$\sqrt{\text{soma}} = 248,4657$$

$$\sqrt{\frac{1}{2\pi}} \times \sqrt{\text{soma}} = 99,123 \text{ A}$$

d)

$$S = 230 \times 99,123 = 22798,29 \text{ VA}$$

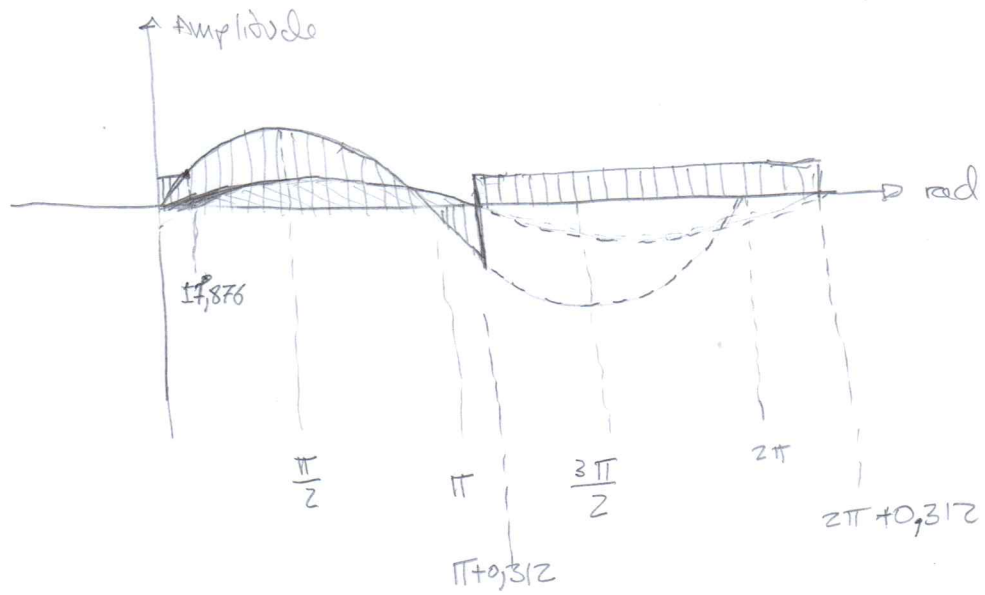
$$P = R I^2 \quad \vee \quad P = \frac{1}{2\pi} \int_0^{\pi} 230\sqrt{2} \sin(\theta) \times (162,63 \sin(\theta) + 25) d\theta$$

$$= 15813,03863$$

exercício 4

a) $100 = 230\sqrt{2} \sin(\theta)$
 $\theta = 0,312$

$\omega L = 25,132 \Omega \angle -68,30^\circ$
 $R = 10 \Omega$
 $Z = 27,049 \angle -68,30^\circ$



b)

Exercício 4

$$\alpha = 90^\circ$$

$I(\theta) = 0$	Time
-2,862	$-9 \cdot 10^{-3}$
0	0
2,0815	$6,6 \cdot 10^{-3}$
6,8336	0,0217
8,0965	0,0257

$$V_{\text{average}} = \frac{1}{T} \int_{0 + \frac{\pi}{2}}^{2,0815 + \frac{\pi}{2}} V_{\text{max}} \sin(\theta) = 45,16 \text{ Volt}$$

$$V_o(\theta) \begin{cases} 100, & 0 < \theta < \frac{\pi}{2} & - 25 \\ V_m \sin(\theta), & \frac{\pi}{2} < \theta < \frac{\pi}{2} + 2,0815 & - 45,16 \\ 100, & \frac{\pi}{2} + 2,0815 < \theta < 2\pi & - \underline{41,87} \\ & & 112,03 \text{ V} \end{cases}$$

$$V_{\text{rms}} = \sqrt{\frac{1}{T}} \times \sqrt{\int_0^T (V_o(\theta))^2 d\theta}$$

$$V_o(\theta) \begin{cases} 100, & 0 < \theta < \frac{\pi}{2} & - 5000\pi \\ V_m \sin(\theta), & \frac{\pi}{2} < \theta < \frac{\pi}{2} + 2,0815 & - 87553,63 \\ 100, & \frac{\pi}{2} + 2,0815 < \theta < 2\pi & - \underline{26308,89} \\ & & 94240,82 \end{cases}$$

$$\sqrt{\frac{1}{2\pi}} \times \sqrt{\sum \frac{5000\pi + 87553,63}{+ 26308,89}} = 143,602 \text{ V}$$