

Disciplina: 169081 - Circuitos Polifásicos.

Semestre: 2013.1.

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LISTA DE EXERCÍCIOS 1 – PARTE 1 – GABARITO

1. $R = 7,142 \Omega$; $L = 22,58 \text{ mH}$.

2. $f = 393,08 \text{ Hz}$.

3. $f = \frac{R_1 + R_2}{2\pi \sqrt{LCR_1^2 - L^2}}$.

4. $I_2 = 159,97 \mu\text{A}$.

5.

a)

$Z_1 = 10 \Omega$	$Y_1 = 100 \text{ mS}$
$Z_2 = j3,77 \Omega$	$Y_2 = -j265,25 \text{ mS}$
$Z_3 = -j265,25 \Omega$	$Y_3 = j3,77 \text{ mS}$
$Z_4 = 6 - j663,13 \Omega$	$Y_4 = 1,36 \cdot 10^{-2} + j1,508 \text{ mS}$
$Z_5 = 15 + j18,85 \Omega$	$Y_5 = 25,85 - j32,48 \text{ mS}$
$Z_6 = j11,175 \Omega$	$Y_6 = -j89,487 \text{ mS}$

b)

$$Y_{eq} = 125,861 - j381,96 \text{ mS} \quad Z_{eq} = 0,7782 + j2,3616 \Omega$$

c)

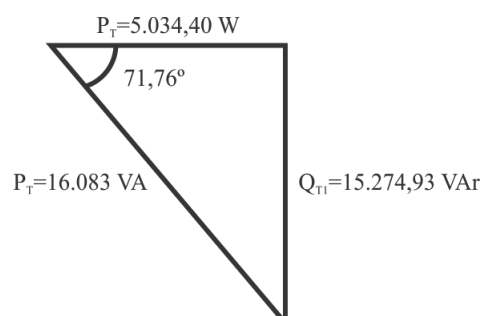
$\hat{I}_1 = 20 \angle 10^\circ \text{ A}$	$\hat{I}_4 = 0,301 \angle 99,48^\circ \text{ A}$	$\hat{I}_T = 80,43 \angle -61,76^\circ \text{ A}$
$\hat{I}_2 = 53,05 \angle -80^\circ \text{ A}$	$\hat{I}_5 = 8,30 \angle -41,49^\circ \text{ A}$	
$\hat{I}_3 = 0,75 \angle 100^\circ \text{ A}$	$\hat{I}_6 = 17,897 \angle -80^\circ \text{ A}$	

d)

$S_1 = 4.000 \text{ VA}$	$fp_1 = 1,0$
$S_2 = 10.610 \angle 90^\circ \text{ VA}$	$fp_2 = 0,0 \text{ ind}$
$S_3 = 150,8 \angle -90^\circ \text{ VA}$	$fp_3 = 0,0 \text{ cap}$
$S_4 = 60,18 \angle -89,48^\circ \text{ VA}$	$fp_4 = 0,009 \text{ cap}$
$S_5 = 1.660 \angle 51,49^\circ \text{ VA}$	$fp_5 = 0,62 \text{ ind}$
$S_6 = 3.579,4 \angle 90^\circ \text{ VA}$	$fp_6 = 0,0 \text{ ind}$

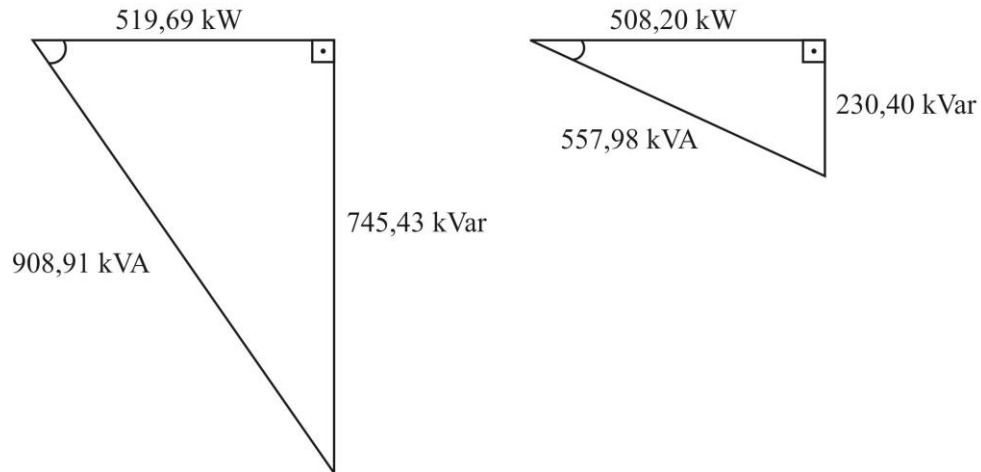
e)

$S_T = 16.085,78 \angle 71,762^\circ \text{ VA}$	$fp_T = 0,31 \text{ ind}$
$Q_T = 15.274,93 \text{ VAR}$	
$P_T = 5.034,40 \text{ W}$	



- f) $Q_C = 13.623,12 \text{ VAr}$.
- 6.
- a)
- | | | |
|---|---------------------------------|--|
| $S_{10-j3} = 1.419,42 \angle -16,69^\circ \text{ VA}$ | $fp_{10-j3} = 0,96 \text{ cap}$ | $\hat{V}_{10-j3} = 121,73 \angle -30,54^\circ \text{ V}$ |
| $S_{3-j2} = 30,27 \angle -33,69^\circ \text{ VA}$ | $fp_{3-j2} = 0,83 \text{ cap}$ | $\hat{V}_{3-j2} = 10,45 \angle 61,05^\circ \text{ V}$ |
| $S_{5+j7} = 1.427,08 \angle 54,46^\circ \text{ VA}$ | $fp_{5+j7} = 0,58 \text{ ind}$ | $\hat{V}_{5+j7} = 110,79 \angle 28,03^\circ \text{ V}$ |
| $S_{9-j3} = 75,33 \angle -18,44^\circ \text{ VA}$ | $fp_{9-j3} = 0,95 \text{ cap}$ | $\hat{V}_{9-j3} = 26,73 \angle -77,03^\circ \text{ V}$ |
| $S_{8+j5} = 16,43 \angle 32,0^\circ \text{ VA}$ | $fp_{8+j5} = 0,85 \text{ ind}$ | $\hat{V}_{8+j5} = 12,45 \angle 53,44^\circ \text{ V}$ |
| $S_{5+j4} = 68,33 \angle 38,66^\circ \text{ VA}$ | $fp_{5+j4} = 0,78 \text{ ind}$ | $\hat{V}_{5+j4} = 20,92 \angle -50,11^\circ \text{ V}$ |
- b)
- | | | |
|----------|---|--|
| Fonte F1 | $S_{125 \angle -20^\circ} = 1457,5 \angle -6,15^\circ \text{ VA}$ | $fp_{125 \angle -20^\circ} = 0,99 \text{ cap}$ |
| Fonte F2 | $S_{100 \angle 10^\circ} = 1.288,0 \angle 36,16^\circ \text{ VA}$ | $fp_{100 \angle 10^\circ} = 0,81 \text{ ind}$ |
| Fonte F3 | $S_{10 \angle 0^\circ} = 209,2 \angle -49,80 \text{ VA}$ | $fp_{10 \angle 0^\circ} = 0,64 \text{ cap}$ |
- c)
- | | |
|-------------------------------|---|
| $Z_{th} = 2,6 - j1,04 \Omega$ | $\hat{V}_{th} = 10,45 \angle 61,05^\circ \text{ V}$ |
|-------------------------------|---|
- d) fonte F1: predominantemente capacitivo
 fonte F2: predominantemente indutivo
 fonte F3: predominantemente capacitivo
- 7.
- a) $\hat{I} = 362,32 \angle -53,13^\circ \text{ A}$.
- b)
- | | | | |
|--|----------------------------|-----------------------------|----------------------------|
| $S_T = 908,704 \angle 55,12^\circ \text{ kVA}$ | $P_T = 519,697 \text{ kW}$ | $Q_T = 745,43 \text{ kVAr}$ | $fp_T = 0,572 \text{ ind}$ |
|--|----------------------------|-----------------------------|----------------------------|
- c)
- | | |
|--|--|
| $S_L = 81,19 \angle 75,96^\circ \text{ kVA}$ | $Perdas \text{ Ativas} = 19,69 \text{ kW}$ |
|--|--|
- d) $Q_C = 469,054 \text{ kVAr}$.
- e)
- | | | |
|--|-------------------------------|---|
| $\hat{I} = 233,754 \angle -21,56^\circ \text{ A};$ | $Q_T = 230,397 \text{ kVAr};$ | $S_L = 33,79 \angle 75,96^\circ \text{ kVA};$ |
| $S_T = 557,984 \angle 24,39^\circ \text{ kVA};$ | $fp_T = 0,9108 \text{ ind};$ | $P_L = 8,20 \text{ kW}.$ |
| $P_T = 508,196 \text{ kW};$ | | |

f)



g) *Redução da corrente* = 35,48%.

Redução da potência aparente = 38,59%