Mmq
Mark: 6.5/10 (total score: 6.5/10)

+4/1/48+

Example Exam - Basic Electricity, 08/10/2018

Name: .....

Student ID:

0	0	0	0	0	0	0	0
1	1	1	1	1	1	■	1
■	2	2	2	2	2	2	2
3	3	3	3	3	■	3	■
4	4	4	4	4	4	4	4
5	5	5	5	■	5	5	5
6	■	6	6	6	6	6	6
7	7	7	7	7	7	7	7
8	8	8	8	8	8	8	8
9	9	■	■	9	9	9	9

In the following circuit, where source voltage is $V_s = 127$ V, current and active power measurements were taken:

- $I_2 = 1$ A;
- $I_3 = 3$ A;
- $P_3 = 280$ W (measured in RL branch)

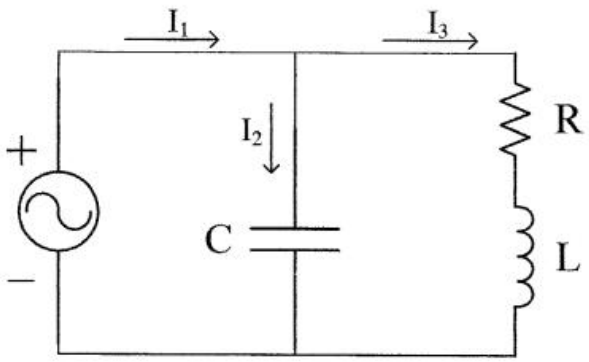

Figura 4: Circuit

Question 1 Find the magnitude for current I_1, in amperes.

1.5/2

$P_3 = R\,|\dot{I}_3|^2 \rightarrow 280 = R \cdot 3^2 \rightarrow R = 31\,\Omega$

$\sqrt{31^2 + X^2} = \frac{127}{3} \rightarrow X = 29\,\Omega$

$\dot{I}_2 = \frac{V_S}{\bar{Z}_C} \rightarrow j3 = \frac{127}{\bar{Z}_C} \rightarrow \bar{Z}_C = -j127\,\Omega$

$\bar{Z}_{eq} = (R + jX) // (\bar{Z}_C) = (52{,}45 \angle 25{,}54°)\,\Omega$

$I_1 = 127\angle 0° / (52{,}45 \angle 25{,}54°) = 2{,}42 \angle -25{,}54°$

Question 2 Find the power factor in the RL branch (leading or lagging).

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$\dot{I}_3 = \frac{127\angle 0°}{31 + j29} = (2{,}99 \angle -43{,}1°)\,A$

$\cos 43{,}1° = 0{,}73$

Question 3 Find the reactive power supplied by the voltage source, in VAr.

2/3

~~$\cos 25{,}54° = 0{,}90$~~

$Q = Q_L + Q_C$

$Q_L = |\dot{I}_3|^2 X = 2{,}99^2 \cdot 29 = 259{,}3\,VAr$

$Q_C = -|\dot{I}_2|^2 X_C = -3^2 \cdot 127 = -127\,VAr$

$Q = 132{,}26\,VAr$

Question 4 Describe the procedure and assumptions that should be followed to find the capacitor that adjusts the power factor to a specific value.

0 0.5 [redacted] 1.5 2 2.5 3

1/3