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## **Basic Electricity – Unit 15: Inductance and AC**

### *Homework 1*

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1. A circuit has a 25 milli-henry inductor and a 200  $\Omega$  resistor.  
The frequency is 1000 hz.  
Calculate all values using the example as a guide.
  
2. A circuit has a 25mH inductor and a 35 mH inductor in a series with a 400  $\Omega$  resistor.  
The frequency is 1000 hz.  
Calculate all values using the example as a guide.





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Examples:

$X_L = 2\pi fL$   
 $= 2\pi(60\text{Hz})(0.005\text{H})$   
 $= 1.885\Omega$

$Z_T = \sqrt{R^2 + X_L^2}$   
 $= \sqrt{(2\Omega)^2 + (1.885\Omega)^2}$   
 $= 2.748\Omega$

$I_T = \frac{V_s}{Z_T} = \frac{100\text{V}}{2.748\Omega} = 36.390\text{A}$

$V_R = (I_T)(R)$   
 $= (36.390\text{A})(2\Omega)$   
 $= 72.780\text{V}$

$V_L = (I_T)(X_L)$   
 $= (36.390\text{A})(1.885\Omega)$   
 $= 68.595\text{V}$

$P_R = P_{\text{TRUE}} = (I_T)(I_T)(R)$   
 $= (36.390\text{A})(36.390\text{A})(2\Omega)$   
 $= 2639.0\text{ VA}$

$P_R = P_{\text{REACTIVE}} = (I_T)(I_T)(X_L)$   
 $= (36.390\text{A})(36.390\text{A})(1.885\Omega)$   
 $= 2496.172\text{ VAR}$

$P_T = P_{\text{COMPLEX}} = (I_T)(I_T)(Z_T)$   
 $= (36.390\text{A})(36.390\text{A})(2.748\Omega)$   
 $= 2648.464\text{ WATTS}$

$\tan \theta = \frac{\text{opp}}{\text{adj}}$   
 $\tan \theta = \frac{X_L}{R}$   
 $\theta = \tan^{-1} \frac{X_L}{R}$   
 $= \tan^{-1} \frac{1.885}{2}$   
 $= \tan^{-1} 0.9425$   
 $= 43.305^\circ$

$P_R = \text{Preactive} = (V_L)(I_T)$   
 $= (68.595\text{V})(36.390\text{A})$   
 $= 2496.172\text{ VAR}$

$P_T = P_{\text{TRUE}} = (V_R)(I_T)$   
 $= (72.780\text{V})(36.390\text{A})$   
 $= 2639.0\text{ VA}$

$P_T = P_{\text{COMPLEX}} = (V_T)(I_T)$   
 $= (100\text{V})(36.390\text{A})$   
 $= 2639.0\text{ VA}$





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