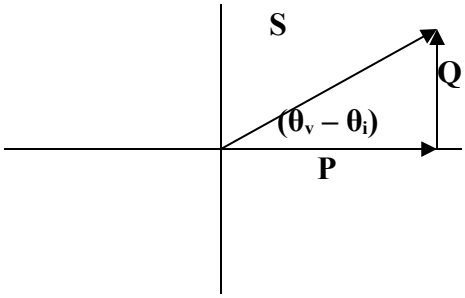
ELEC 302 Pre-Lab #1



Power Triangle Equations:

Apparent Power $\mathbf{S = V_{rms}\, I_{rms}}$

Peal Power $\mathbf{P = V_{rms}\, I_{rms}\, \cos(\theta_v - \theta_i)}$

Reactive Power $\mathbf{Q = V_{rms}\, I_{rms}\, \sin(\theta_v - \theta_i)}$

Power factor $\mathbf{p.f. = \cos(\theta_v - \theta_i)}$

Calculations:

1. $I_R = \frac{E_1}{R} = \frac{60}{1200} = 0.05A$
2. $I_L = \frac{E_1}{j\omega L} = \frac{60}{j2\pi 60 \cdot 0.8} = \frac{60}{j300} = 0.2A\angle -90$
3. $I_C = \frac{E_1}{1/j\omega C} = \frac{60}{1/j2\pi 60 \cdot 0} = \frac{60}{-j\infty} = 0.A\angle 90$
4. $I_1 = I_R + I_L + I_C = 0.05 - j0.2 = 0.206\angle -75.9 = 0.2A\angle -76$
5. $\theta = (\theta_v - \theta_i) = -76$
6. $S = E_1 I_1 = 60 \cdot 0.206 = 12.36 = 12.4\,VA$
7. $P = E_1 I_1 \cos(\theta_v - \theta_i) = 60 \cdot 0.206 \cos(0 - -76) = 60 \cdot 0.206 \cos(76) = 3W$
8. $Q = E_1 I_1 \sin(\theta_v - \theta_i) = 60 \cdot 0.206 \sin(0 - -76) = 12\,VAR$
9. $p.f. = \cos(\theta_v - \theta_i) = \cos(0 - -76) = 0.24 lag$

Table with some check values provided. Students should complete table before lab.

Computed Values

R Ω	L H	C µF	I1 A	E1 V	P W	Θ Deg.	S VA	Q VAR	p.f. lag/lead
1200	0.8	---	0.21	60	3	76	12.4	12	0.24 lag
1200	0.8	2.2	0.16	60	3	71	9.5	9	0.32 lag
1200	0.8	4.4		60					
1200	0.8	8.8	0.05	60	3	0	3	0	1
1200	1.6	---	0.11	60	3	63	6.7	6	0.45 lag
1200	1.6	2.2		60					
1200	1.6	4.4	0.05	60					
120	1.	8.8		60					

0	6								