EE4226 - EXPERIMENT #1

LABORATORY PRACTICES, BASIC MEASUREMENTS, AND SAFETY

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Part 1: (Checkmark the meters you have)

2. Dual DC Voltmeter X Dual DC Ammeter X

DC Volt/Ammeter X

Dual AC Voltmeter X AC Ammeter with CT X

AC Volt/Ammeter X AC Wattmeter X

Fluke 289 Multimeter X

Part 2:

7. V_{dc} = 90 Volts I_{dc} = 2.3 Amps I_{Clamp} = ____ Amps P_{dc} = 207 Watts

8. V_{dc} = 90 Volts, I_{dc} = 8.1 Amps, I_{Clamp} = ____ Amps P_{dc} = 729 Watts

Part 3:

12. V = 120 Volts I = 3.4 Amps I_{Clamp} = 3.5 Amps P = 46 Watts

p.f. = ____ (Inductive - LOAD)

13. V = 120 Volts I = 5.8 Amps I_{Clamp} = 5.8 Amps P = 563 Watts

p.f. = ____ (Resistive - Inductive - LOAD)

14. V = 120 Volts I = 4.8 Amps I_{Clamp} = 4.8 Amps P = 560 Watts

p.f. = ____ (Resistive - Inductive - Capacitive - LOAD)

2×30μF

3×150W

Post Lab Questions:

1. Describe why it is good practice to close shorting switches and set ranges to their maximum values before energizing a circuit.

   In order to prevent fuses or parts from being blown from initial voltage spikes

2. Calculate the impedance of each of the following: a 150W resistor switch (rated at 120V), one of the fixed inductors, and one 30µF capacitor switch. Show your work.

   $P = IV = \frac{V^2}{R} \rightarrow R = \frac{V^2}{P} = \frac{(120)^2}{150} = \boxed{96\Omega}$

3. Why are the resistors in the load rated in watts? What happens inside the cart as you turn more switches on?

   It indicates how much power consumption is added.

4. Provide the power triangles for steps 12, 13, and 14. Show your work and include the values of P, Q, S, and Θ.

5. Describe the benefits of power factor correction in industry.

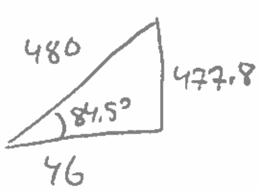
   in order to convert complex power into real power.

6. Calculate the value of capacitance that you would need to add to your step 13 circuit to obtain exactly unity power factor.

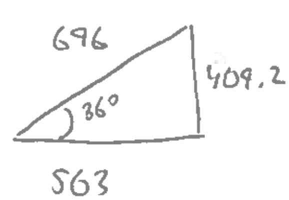
   $pf = 1.0 \Rightarrow Q_{cap} \doteq 409.2\text{VAR}$

   $X_c = \frac{V_{rms}^2}{Q_{cap}} = \frac{120^2}{409.2} = 35.19 = \frac{1}{\omega C} \Rightarrow C = \frac{1}{35.19 \cdot 2\pi 60} = \boxed{75.4\mu F}$

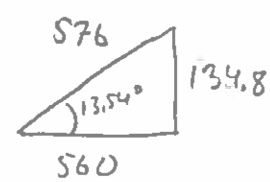
12.)



13.)



14.)



$S = V \cdot I^* = 120 \times 3.4$

$Q = \sqrt{S^2 - P^2} = \sqrt{480^2 - 46^2} = 477.8$

$\theta = \cos^{-1}\left(\frac{46}{480}\right) = 84.5°$

$S = 120 \times 5.8 = 696$

$Q = \sqrt{696^2 - 563^2} = 409.2$

$\theta = \cos^{-1}\left(\frac{563}{696}\right) = 36.01°$

$S = 120 \times 4.8 = 576$

$S = \sqrt{576^2 - 560^2} = 134.8$

$\theta = \cos^{-1}\left(\frac{560}{576}\right) = 13.54°$