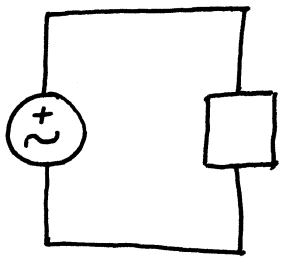
GIVEN:

$120V_{RMS}$

60 Hz



$Z = 10 + j12\ \Omega$

FIND: A) pf B) P_{AVE} C) C FOR UNITY pf

SOLN: FIND I: $120\angle 0 = I\,(10 + j12)$

$I = 7.68\angle -50.2^\circ\ A_{RMS}$

A) $pf = \cos(\theta_V - \theta_I) = \cos(0 - (-50.2))$

$= \underline{\underline{0.64 \text{ LAGGING}}}$

B) $P_{AVE} = V_{RMS} I_{RMS}\ pf$

$= 120\,(7.68)\,(0.64) = \underline{\underline{590\ W}}$

C) WE NEED Q ... $\tan(50.2) = \dfrac{Q}{P}$

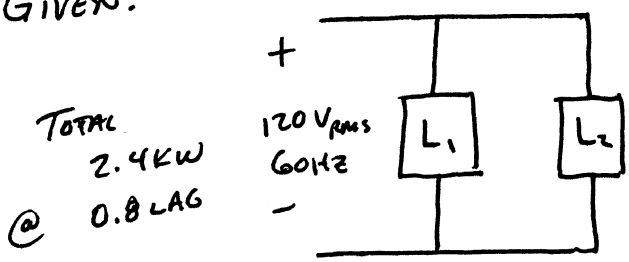
SO, $Q = 708.14$ VAR

NEED $|Q_c| = |Q|$ AND...

$$C = \frac{Q_c}{\omega V_{RMS}^2} = \frac{708.14}{377\,(120)^2} = \underline{\underline{130\mu F}}$$

TOPS 35510 - 100 sheets 35520 - 200 sheets

GIVEN:



TOTAL 2.4KW @ 0.8 LAG

$L_1 = 1.5$ KW @ 0.707 LAG

FIND: A) pf OF L_2 B) PARALLEL ELEMENT TO GET pf=0.9 LAG TOTAL

SOLN: A) $\frac{Q_T}{P_T} = \tan(\cos^{-1}(0.8))$ $\frac{Q_1}{P_1} = \tan(\cos^{-1}(0.707))$

SO, $Q_T = 1.8$ KVAR $Q_1 = 1.5$ KVAR

BOTH ARE INDUCTIVE

SO, $Q_T = Q_1 + Q_2 \therefore Q_2 = 0.3$ KVAR

$$pf = \cos\left(\tan^{-1}\left(\frac{0.3}{0.9}\right)\right) = \underline{0.949 \text{ LAGGING}}$$

B) FOR pf=0.9 $\frac{Q_T}{P_T} = \tan(\cos^{-1}(0.9))$

$Q_T = 1.16$ KVAR

SO WE NEED $Q_c = 0.64$ KVAR

$$\therefore C = \frac{Q_c}{\omega V_{RMS}^2} = \frac{0.64}{377(120)^2} = 118\,\mu F$$

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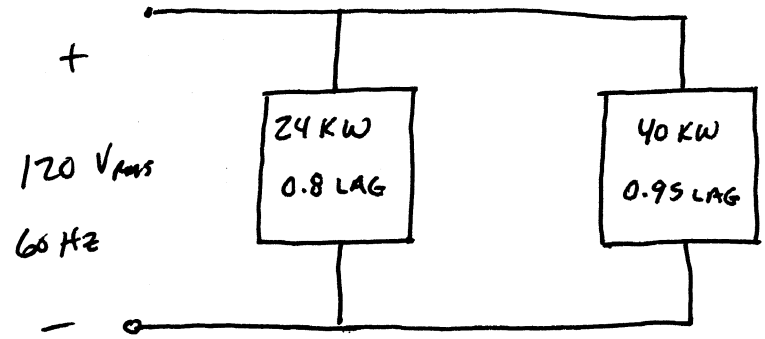
GIVEN:



FIND: A) pf TOTAL B) C FOR UNITY pf

SOLN: A) $P_T = P_1 + P_2$ $Q_T = Q_1 + Q_2$

SO, $P_T = 64\text{ KW}$ $Q_T = 18\text{ KVAR} + 13.15\text{ KVAR}$

$= 31.5\text{ KVAR}$

AND $\underline{pf} = \cos\left(\tan^{-1}\left(\frac{Q_T}{P_T}\right)\right)$

$= \underline{\underline{0.897 \text{ LAGGING}}}$

B) FOR UNITY pf WE NEED $Q_c = 31.5\text{ KVAR}$

SO, $\underline{C} = \dfrac{31.5}{377(120)^2} = \underline{\underline{5.8\text{ mF}}}$

TOPS 35510 - 100 sheets 35520 - 200 sheets