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Exp 10 AC & DC power Analysis:-

Back to Def p 88

P_{av} :- Real power (Average power, Working Power) KW

(Q) : Reactive power KVAR

KVA : Apparent power $(S) = P_{av} + Q\hat{j}$ + : lagging, − : leading

• Power factor $= \frac{P_{av}}{(P_a)} \leftarrow S = \cos(\theta_v - \theta_i)$

→ • large KVR (Q) is caused by inductive loads such as: Transformers / induction motors / Induction Generators and High intensity discharge lighting

→ • Power factor correction:- Using Capacitors

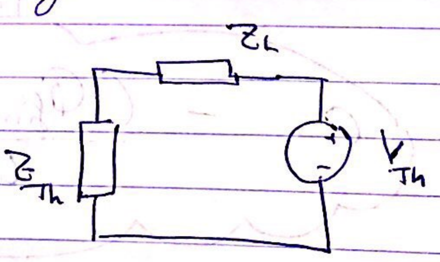
* Maximum Power is reached by $R_{Load} = R_{Th}$

• Efficiency $= \frac{P_{out}}{P_{in}} \times 100\%$ (%)

$P_{max} = \frac{1}{8} \frac{V_{Th}^2}{(R_L)}$ Real part

→ When $R_{Load} = R_{in}$ efficiency = 50%

* $Z_{Th} = R_{Th} + X_{TH} j$
* $Z_L = R_L + X_L j$



$I = V_{Th} / Z_{Th} + Z_L$

$P_{av} = \frac{1}{2} I^2 (R_L)$

Now for Max Power $Z_L = Z_{Th}^*$ Same Real part and I_m Difference in direct

• Average Pow: Resistor, $\frac{I^2 R}{2}$

Inductor : 0

Capacitor : 0

• $P_{apparent} = V_{rms} I_{rms}^*$

$P_{av} = P_a . P_F = V_{rms} I_{rms} \cos(\theta_v - \theta_i)$

Now: P_F : 1- Resistor = 1
2- Induct = 0
3- Capacitor = 0
4- Inductive : $0 < PF < 1$
5- Capacitive : $0 < PF < 1$

$Q = V_{rms} I_{rms} \sin(\theta_v - \theta_i)$
: Resistor $Q_R = 0$
Inductor $Q_L = \frac{V_{rms}^2}{\omega L}$
Capacitor $Q_c = \frac{-I_{rms}^2}{\omega_c} = -\omega C (V_{rms})^2$

$\cos \theta = PF$

$\theta = \tan^{-1}\left(\frac{Q}{P_{av}}\right)$

$$C = -\frac{(Q_{final} - Q_{initial})}{\omega V_{rms}^2}$$ ← Correction of PF

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