Power

→ The power that continuously bounce back & fourth b/w the source & load is called Reactive power. This can happen both in inductive of capacitive load.

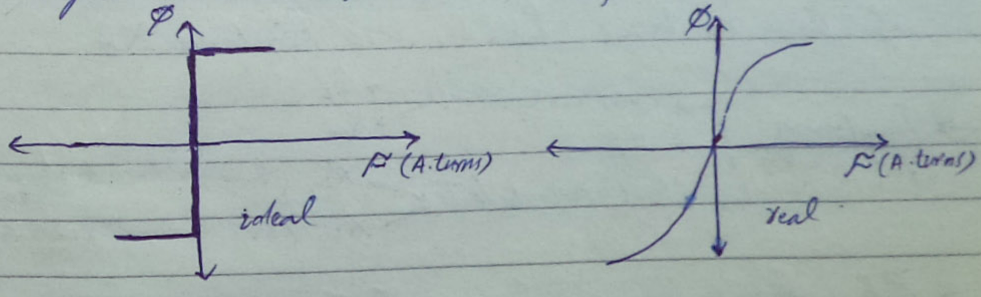
→ If Reactive power Q is +ve, then it is supplied to the load (Inductor) & if Q is -ve then it is supplied by the load to the source (capacitor)

→ The apparent power S is the vector sum of both real & reactive power to the load & Power factor is the fraction of apparent Power, which is supplying the real power 'P' to the load.

→ Power Triangle relations
$\cos\theta = P/S$
$\sin\theta = Q/S$
$\tan\theta = Q/P$

→ Transmission line load & source impedance $Z_L' = a^2 Z_L$
(Source) (load)

→ The magnetization curve for an ideal transformer should be like this:



→ $I_{(eddy)} \propto V_P^2$

→ The Hysteresis losses are complex, nonlinear function of the voltage applied to the transformer.

→ $V_P = aV_S$ & $I_P = I_S/a$ (imp)

Power Transmission lines

→ if load at the end of T.line have Resistance R & Reactance X then

⇒ the P.F of load is $\cos[\tan^{-1}(X/R)]$ if $X = R$ then $P.F = 0.707$ leading.

→ In T.Line if $V_s = 82.6\,KV$, & $V_R = 76.2\,KV$, Find % voltage Regulation of this 3∅ T.line at no load if $A = 0.992$, $B = 55.5$, $C = 0.000315$, $D = 0.0175$

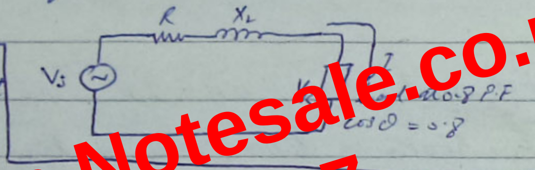
solution: Since $V_s = A V_R + B I_R$

But at no load $I_R = 0$ so $V_s = A V_{R0}$

or V_{R0} at no load $V_{RNL} = V_s / A = \frac{82.6}{0.992} = 83.2\,KV$

so $\%VR = \frac{V_{RNL} - V_R}{V_R} = \frac{83.2 - 76.2}{76.2} = 9.25\%$

→ if A, B, C & D constants are not given then $V_s = V_R + IR\cos\theta + IX_L\sin\theta$



→ when load P.F in 3∅ short T.Line is leading then Voltage Regulation can be both +ve or −ve

→ Each disc insulator can withstand upto 11 KV.

→ Suspension Insulators beyond 33 KV.

→ Strain insulators for less than 11 KV.

→ Insulator's string efficiency $= \eta = \frac{\text{Voltage across whole string}}{n \times \text{Voltage across each string}}$ (where n = no of discs in string)

→ For T.lines, +ve sequence ~~impedence~~ reactance $X_1 = (X_s - X_m)$ & −ve sequence ~~impeden~~ reactance $X_2 = (X_s + 2X_m)$

→ Sag of T.line $= S = \frac{W \times l^2}{8 \times H}$ where W = weight, l = span, H = tension.

→ Load Factor (L.F) = Average load / Max load

→ Demand factor (D.F) = Max load in given time / Max possible load

→ ~~Capacity factor (C.F) = Energy produced in a time / Max energy production capacity.~~

or Demand factor (D.F) = Max load / connected load