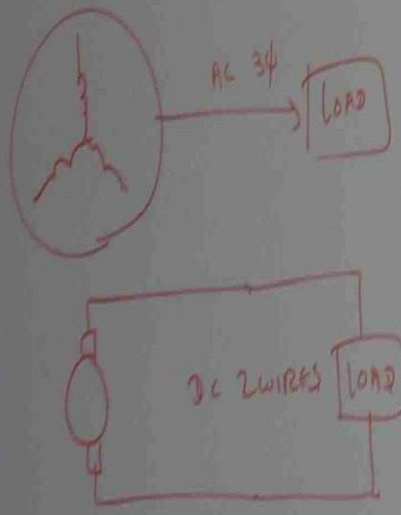
RATIO AND COMPARISON

APPLICATION of RATIO AND COMPARISON IN POWER ENGINEERING.

COMPARING AC AND DC POWER SYSTEM



COMPARING COPPER WEIGHTS.

COPPER REQUIREMENT FOR DC 2WIRES THAN 3φ 3WIRE SYSTEM $= \frac{\text{NO. OF AC CONDUCTORS}}{\text{NO. OF DC CONDUCTORS}} \times \text{RATIO of } \frac{\text{AC CSA}}{\text{DC CSA}}$

ASSUMPTION

(I) AC & DC → SAME POWER MUST BE DELIVERED.

DC POWER DELIVERED = AC POWER DELIVERED. $\Rightarrow 3\times 1\phi \text{ POWER} = 3\times E_{rms}|_{ph} \times P.F$

$$EI = 3\times \frac{E_{max}|_{ph}}{\sqrt{2}} \times I\cos\theta$$

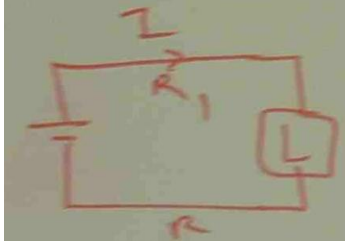
$$EI = 3\frac{E}{\sqrt{2}} I\cos\theta \Rightarrow I = \frac{3I\cos\theta}{\sqrt{2}}$$

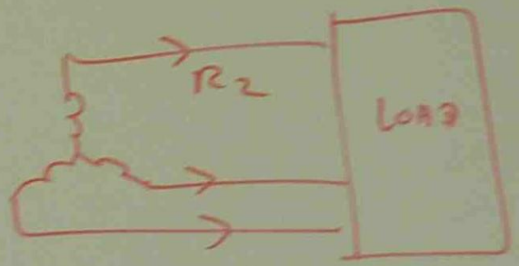
II 2nd PRINCIPLE

COMPARE LINE POWER LOSS

DC POWER LOSS : AC 3ϕ POWER LOSS

$$2I^2R : 3(I')^2R_2$$





$$2\left(\frac{3I'\cos\theta}{\sigma_2}\right)^2 R : 3(I')^2 R_2$$

$$9(I')^2\cos^2\theta\, R_1 : 3(I')^2 R_2$$

$3\cos^2\theta \; R_1 : R_2$

$R = \frac{\rho L}{A}$

ρ = RESISTIVITY
L = LENGTH
A = C.S.A

$R = \frac{\rho L}{A}$

$3\cos^2\theta \; \frac{\rho L}{A_1} : \frac{\rho L}{A_2}$

$\frac{3\cos^2\theta}{A_1} : \frac{1}{A_2}$

$\frac{3\cos^2\theta}{DC \; C.SA} : \frac{1}{AC \; CSA}$

$\frac{AC \; C.SA}{DC \; CS.A} = \frac{1}{3\cos^2\theta}$