Medium Tr. line

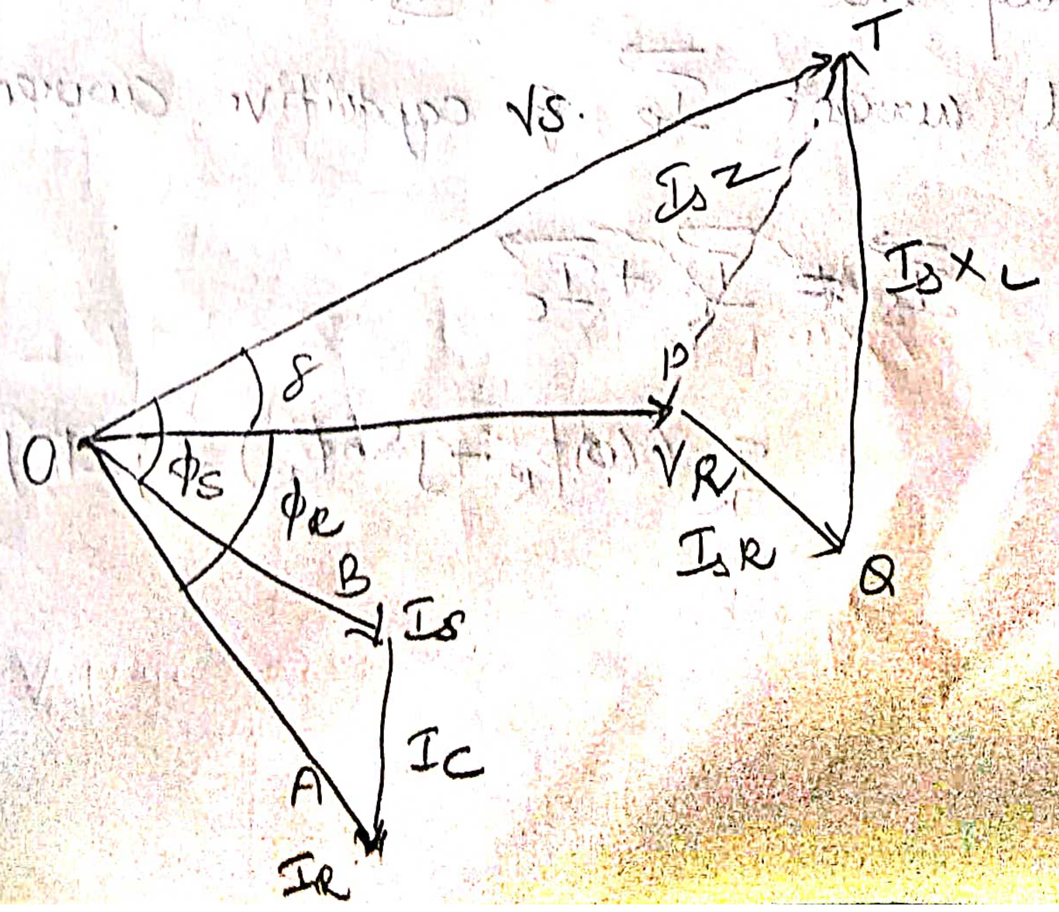
Methods of solution of medium Tr. line.

i) End Condenser method
ii) Nominal T method
iii) " π method

End Condenser method.

The capacitance of line is lumped or concentrated at the receiving method.

This method of localizing capacitance at the load is end condenser method.



Let I_R be the load current/phase

R " " resistance / "

X_L " " inductive reactance / "

C " " capacitance / "

V_S " " sending end voltage

V_R " " receiving end voltage

$\cos\phi_R$ " " receiving end power factor

V_R is taken as ref. vector.

$$\vec{V_R} = V_R + j0$$

The current I_R lags V_R by an angle ϕ_R

$$\vec{I_R} = I_R(\cos\phi_R - j\sin\phi_R)$$

capacitive current $\vec{I_C} = jV_R \omega C$

$$= j2\pi f C V_R$$

Sending end current $\vec{I_S}$ is vector sum of load current $\vec{I_R}$ & capacitive current $\vec{I_C}$

$$\vec{I_S} = \vec{I_R} + \vec{I_C}$$

$$= I_R(\cos\phi_R - j\sin\phi_R) + j2\pi f C V_R$$

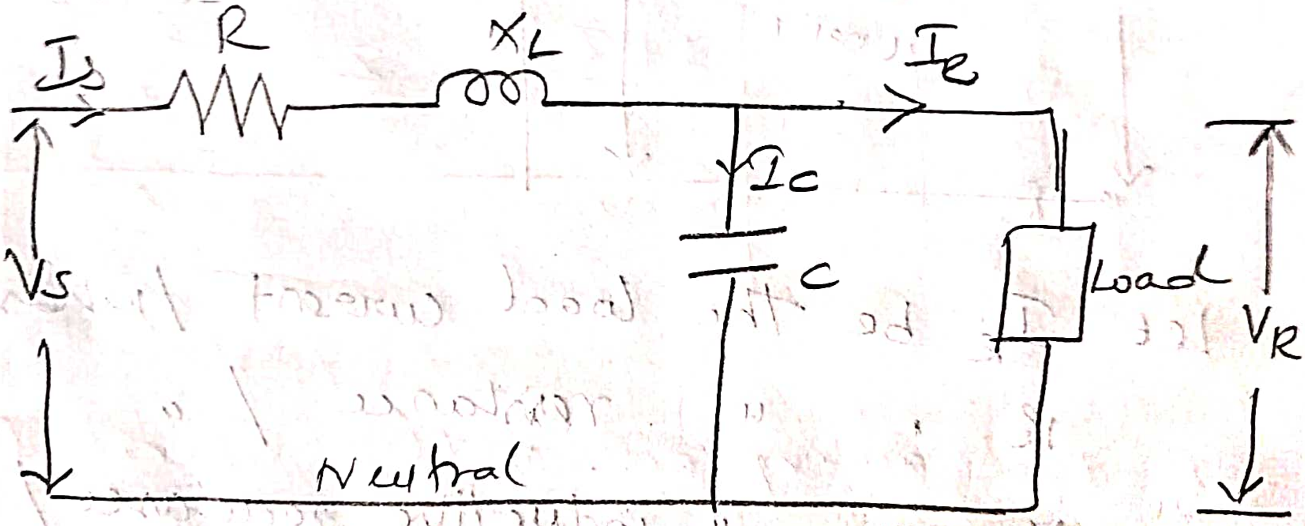
Voltage drop/phase = $\vec{I_s} Z = \vec{I_s}(R + jX_L)$

Sending end voltage = $\vec{V_S} = \vec{V_R} + \vec{I_s} Z$

$= \vec{V_R} + \vec{I_s}(R + jX_L)$

$$\% \text{ Voltage reg.} = \frac{V_S - V_R}{V_R} \times 100$$

$$\% \text{ Tr. } \eta \% = \frac{V_R I_R \cos\phi_R}{V_R I_R \cos\phi_R + I_s^2 R} \times 100$$



Limitations

There is a considerable amount of 10% error in calculations, because the distributed capacitance has been assumed to be lumped.