Performance evaluation of short transmission lines using ABCD parameters

To determine the efficiency and regulation of short transmission lines

Short Transmission Line

A short transmission line is defined as a transmission line with an effective length less than 80 km, or with a voltage less than 69 kV. The line charging current is negligible in short transmission lines and hence the shunt capacitance can be ignored. Other parameters like electrical resistance and inductor of these short lines are lumped.

As the shunt capacitance of the line is neglected, hence the sending end current and the receiving end current is same, i.e.

$$I_s = I_r \tag{1}$$

The Voltage and currents of the transmission network can be represented as (2) and (3), where, A, B, C and D are the ABCD parameters of the transmission network.

$$V_s = AV_r + BI_r \tag{3}$$

$$I_s = CV_r + DI_r \tag{4}$$

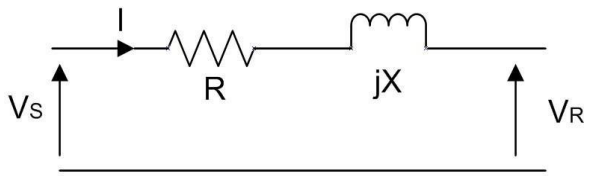
The efficiency of a short transmission line is given by (4), where R is the per phase electrical resistance of the transmission line.

$$\% \text{ Efficiency} = \frac{\text{Power at receiving end}}{\text{Power at receiving end} + 3I_r^2 R} \times 100$$

As per definition of voltage regulation of power transmission line is given by (5),

$$\% \, Voltage \, regulation = \frac{V_{R\,NL} - V_R}{V_R} \times 100 = \frac{V_s/A - V_R}{V_R} \times 100$$

circuit diagram



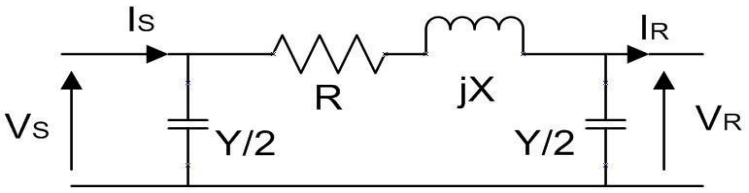
Performance evaluation of medium transmission lines using ABCD parameters for symmetric Π and T- configurations

To determine the efficiency and regulation of medium transmission lines Th

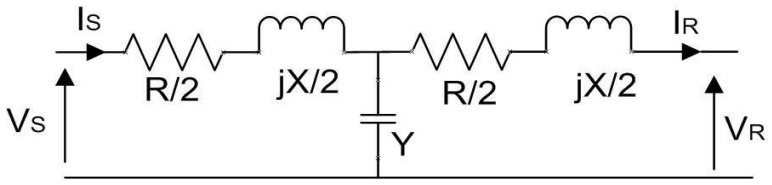
Medium Transmission Line

Transmission lines which are having length more than 80 km and less than 250 km are generally referred to as medium transmission lines. They can be modelled in two ways:

a) Nominal T-model: In this model the shunt capacitance is lumped at the centre and the line impedance is equally divided towards both sending end and receiving end.
b) Nominal π-model: In this model the shunt capacitance is equally divided at both sending end and receiving end and the line impedance is lumped at the centre.



Nominal π model



Nominal T model