THE HALF WAVE LINE: ($\frac{\lambda}{2}$):

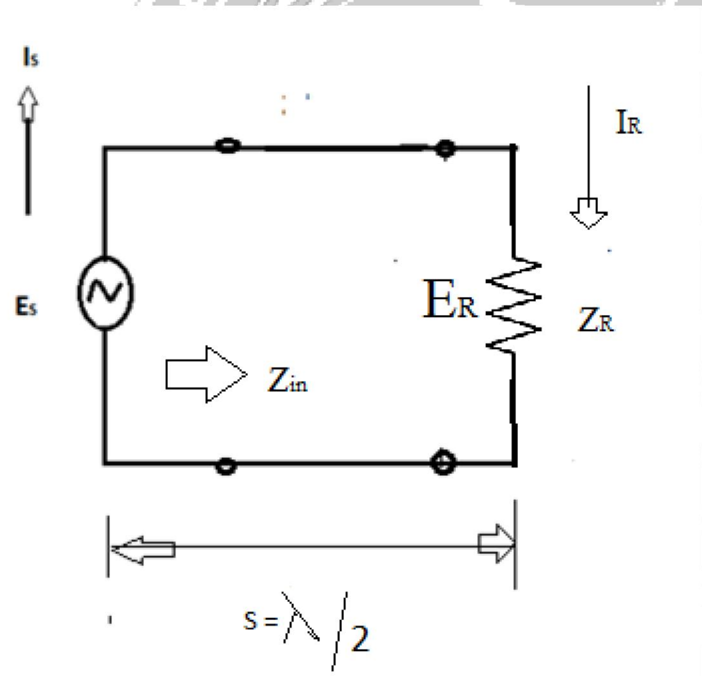

Fig: 3.1.4 The half wave line

Fig 3.1.4 shows the circuit diagram of a transmission line with finite length $\frac{\lambda}{2}$ the input voltage is E_s and current I_s.

The input impedance of the circuit is Z_{in}

The receiving end voltage and current is E_R and I_R.

The distance between sending and receiving end S = $\frac{\lambda}{2}$

We know, the input impedance of the lossless line is given by,

$$z_{in} = \frac{E_S}{I_S} = R_O \left[\frac{Z_R + jR_O \tan\beta s}{R_O + jZ_R \tan\beta s}\right]$$

Sub, **S=** $\frac{\lambda}{2}$, β= $\frac{2\pi}{\lambda}$ in above equ,

$$z_{in} = R_O \left[\frac{Z_R + jR_O \tan\left(\frac{2\pi}{\lambda}\right)\left(\frac{\lambda}{4}\right)}{R_O + jZ_R \tan\left(\frac{2\pi}{\lambda}\right)\left(\frac{\lambda}{4}\right)}\right]$$

$$z_{in} = R_O \left[\frac{Z_R + jR_O \tan(\pi)}{R_O + jZ_R \tan(\pi)}\right]$$

$$z_{in} = R_O \left[\frac{Z_R}{R_O}\right]$$

$$z_{in} = Z_R$$

The half wave line repeats terminating impedance. So the half wave line can be considered as 1:1 transformer.