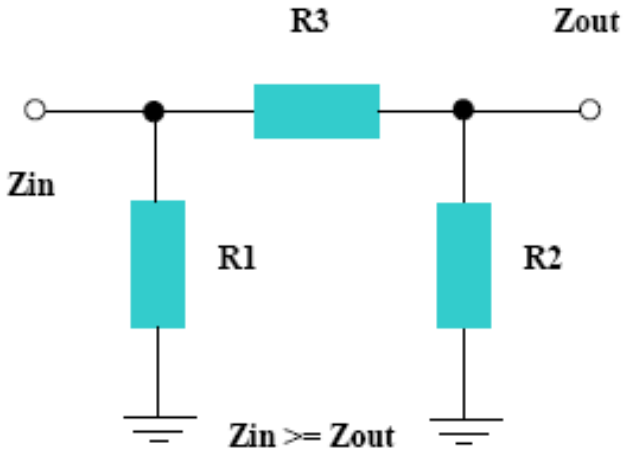
Sistem Telekomunikasi

Minggu ke-02

Attenuator

- An attenuator is an electronic device that reduces the amplitude or power of a signal without appreciably distorting its waveform.
- An attenuator is effectively the opposite of an amplifier, though the two work by different methods. While an amplifier provides gain, an attenuator provides loss, or gain less than 1.
- Attenuators are usually passive devices made from simple voltage divider networks

Pi-Attenuator



$$R3 = \frac{1}{2}\left(10^{\frac{L}{10}} - 1\right)\sqrt{\frac{Zin * Zout}{10^{\frac{L}{10}}}}$$

$$R2 = \frac{1}{\frac{10^{\frac{L}{10}} + 1}{Zout\left(10^{\frac{L}{10}} - 1\right)} - \frac{1}{R3}}$$

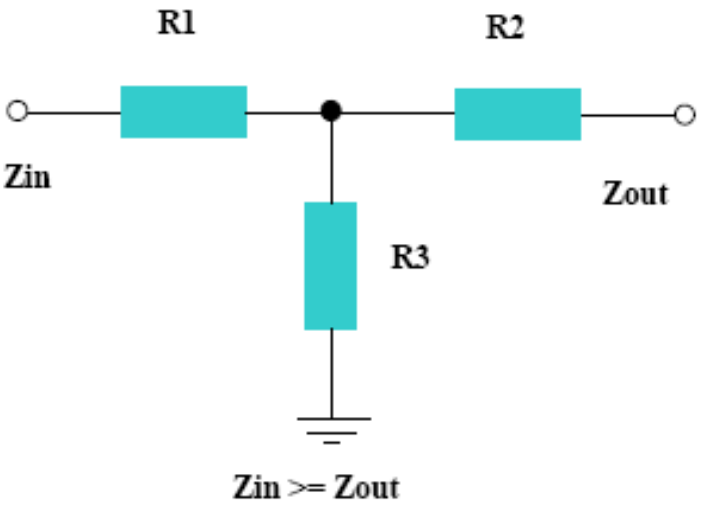
$$R1 = \frac{1}{\frac{10^{\frac{L}{10}} + 1}{Zin\left(10^{\frac{L}{10}} - 1\right)} - \frac{1}{R3}}$$

Where L = desired loss in dB

Zin = desired input impedance (ohms)

Zout = desired output impedance (ohms)

T-Attenuator



$$R3 = \frac{2\sqrt{Zin * Zout * 10^{\frac{L}{10}}}}{10^{\frac{L}{10}} - 1}$$

$$R2 = \frac{10^{\frac{L}{10}} + 1}{10^{\frac{L}{10}} - 1} Zout - R3$$

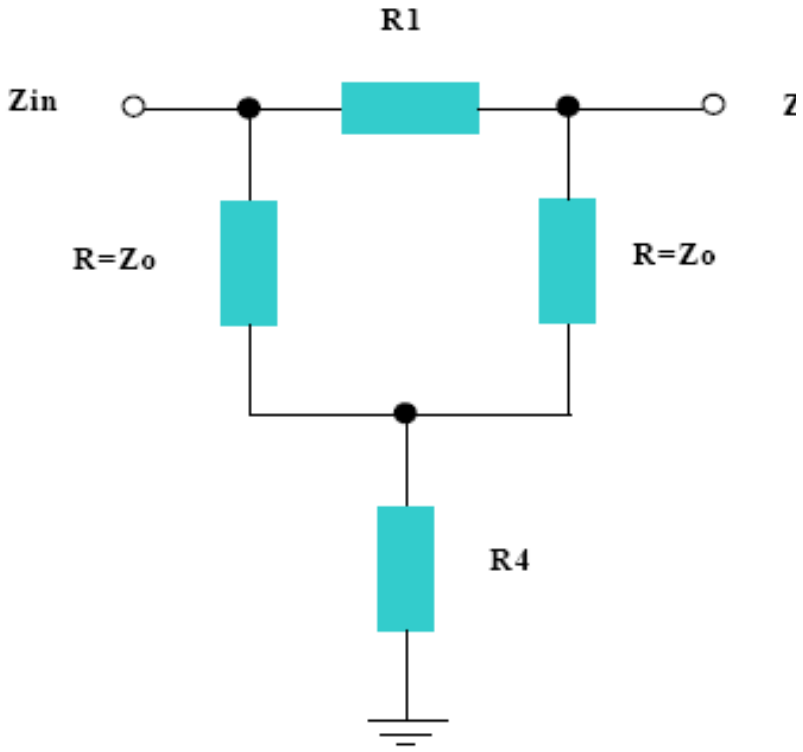
$$R2 = \frac{10^{\frac{L}{10}} + 1}{10^{\frac{L}{10}} - 1} Zin - R3$$

Where L = desired loss in dB

Zin = desired input impedance (ohms)

Zout = desired output impedance (ohms)

Bridge T-Attenuator



$$R1 = Zo\left(10^{\frac{L}{20}} - 1\right)$$

$$R4 = \frac{Zo}{10^{\frac{L}{20}} - 1}$$

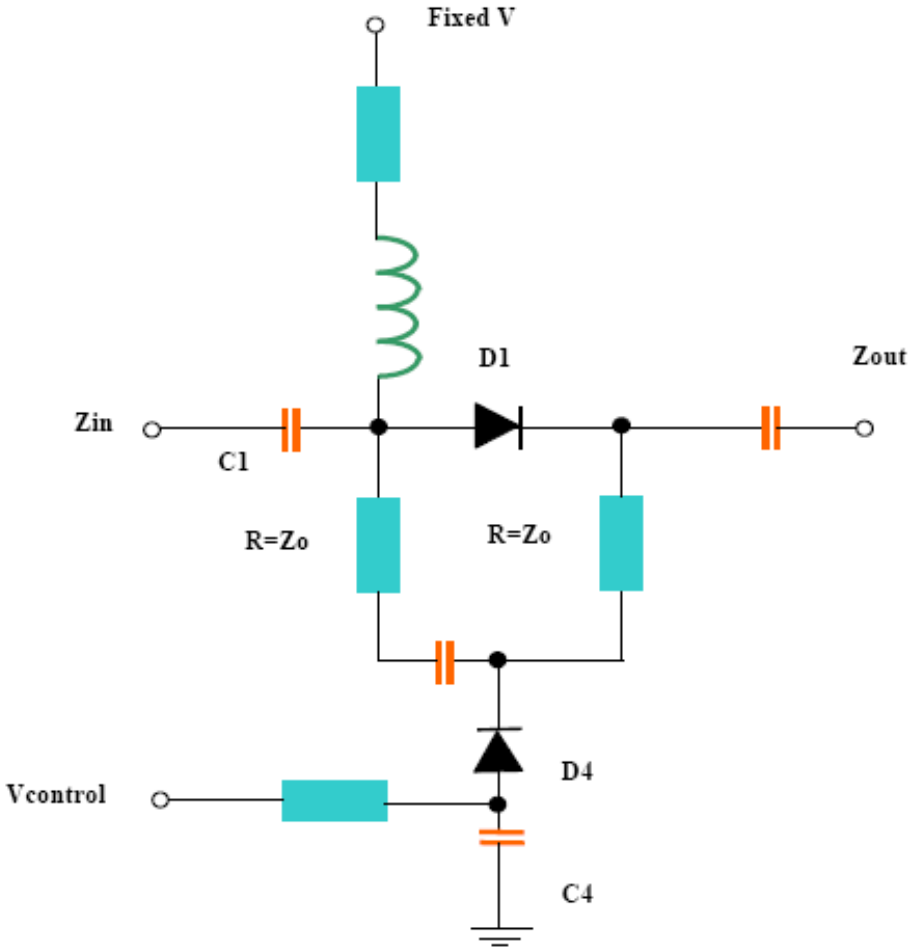
Where L = desired loss in dB

Zin = desired input impedance (ohms)

Zout = desired output impedance (ohms)

Zo = Circuit characteristic impedance (ohms)

Narrow Band Active Attenuator



Minimum attenuation

$$L = 20\log\left(\frac{R1}{50}+1\right) = 20\log\left(\frac{10}{50}+1\right) = 1.58\text{dB approx}$$

Where L = desired loss in dB

Maximum attenuation

$$L = 20\log\left(\frac{R1}{50}+1\right) = 20\log\left(\frac{1500}{50}+1\right) = 29\text{dB approx}$$