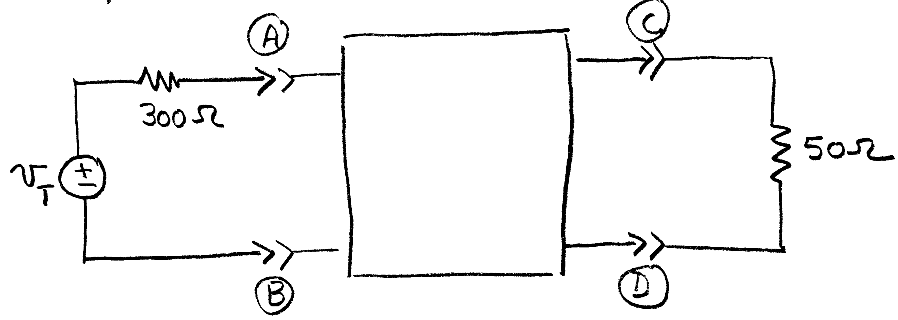
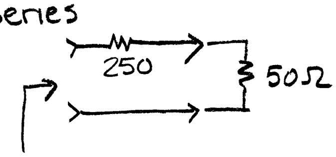
Design Example 3-23



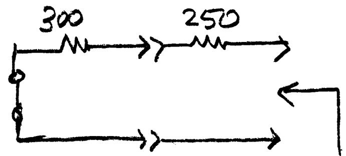
Design the two-port interface circuit so the load "sees" a Thevenin resistance of 50Ω between terminals Ⓒ and Ⓓ, while simultaneously the source "sees" a load resistance of 300Ω between Ⓐ and Ⓑ

<u>Design</u> We can try different interface circuits

Series

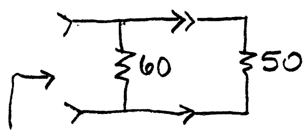


$R_T = 300\Omega$ <u>OK</u>

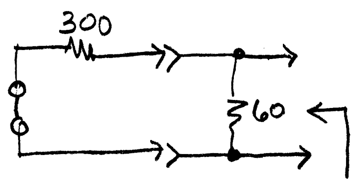


$R_T = 550 >> 50$ <u>NOT OK</u>

Parallel

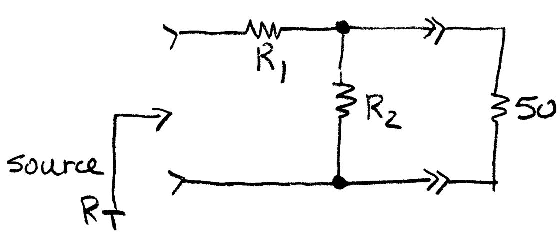


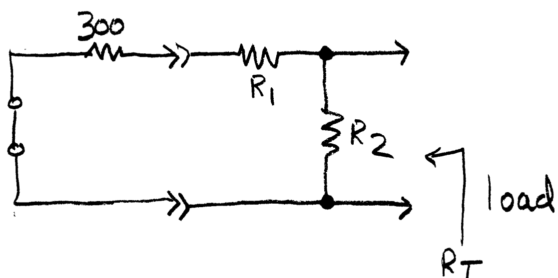
$R_T << 50$ <u>NOT OK</u>



$R_T = 60 \| 300 = 50$ <u>OK</u>

Try two resistor circuits





Want source to see larger resistance than 50 so this requires a series R.

Want load to see a R_T smaller than source so there has to be a parallel resistance.

Design

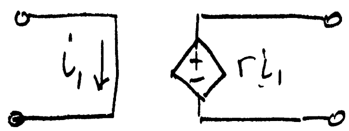
$$R_1 + \frac{50 R_2}{R_2 + 50} = 300 \qquad \frac{(R_1 + 300) R_2}{R_1 + 300 + R_2} = 50$$

Non-linear equations with solutions $R_1 = 273.9$ and $R_2 = 54.8\ \Omega$.

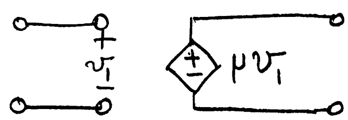
4.1 Linear Dependent Sources

- basis of the operational amplifier
- basis of feedback control

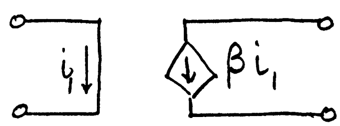
There are four basic types — these are all linear



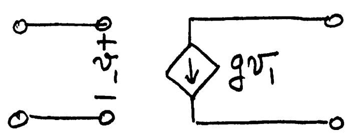
current controlled voltage source
r has units of ohms
transresistance



voltage controlled voltage source
μ is voltage gain



current controlled current source
β is current gain



voltage controlled current source
g has units of siemens
transconductance

1. dependent sources are not in catalogs
2. can not be turned on/off individually — always a source and a <u>controlling</u> voltage/current