EE 206: Solution #2

Electrical Quantities, Kirchoff's Laws, Resistors in Series and Parallel. Due Wed, Jan 23

Electrical Quantities:

1) A resistor has the following volts / amps / resistance / power. Determine the missing parameters:

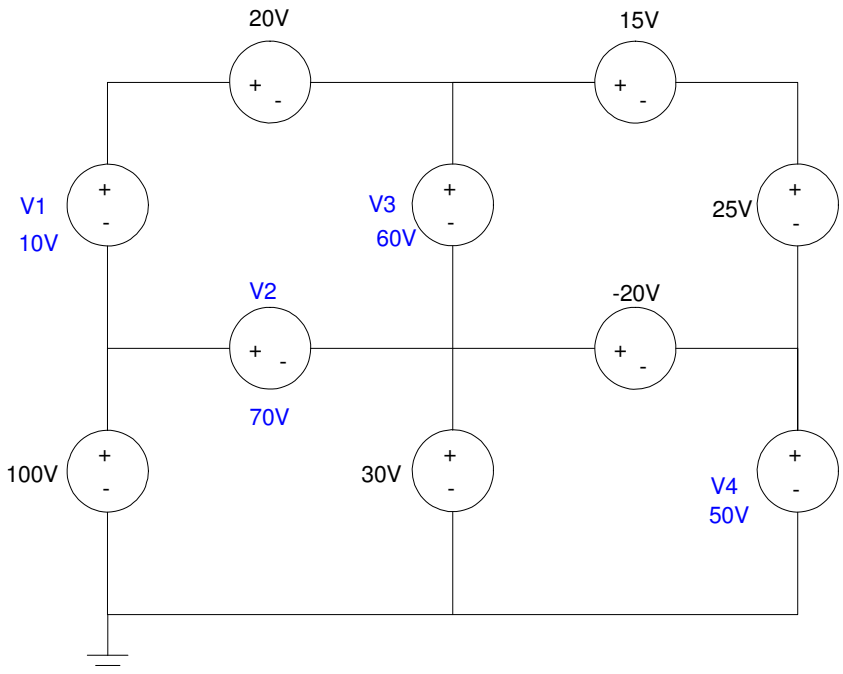
Volts	Amps	Ohms	Watts
5	10	0.5 Ohms	50 W
5	0.5 A	10	2.5 W
2 V	5	0.4 Ohms	10
5	2 A	2.5 Ohms	10

Note: $V = IR$ $P = VI$

Kirchoff's Laws:

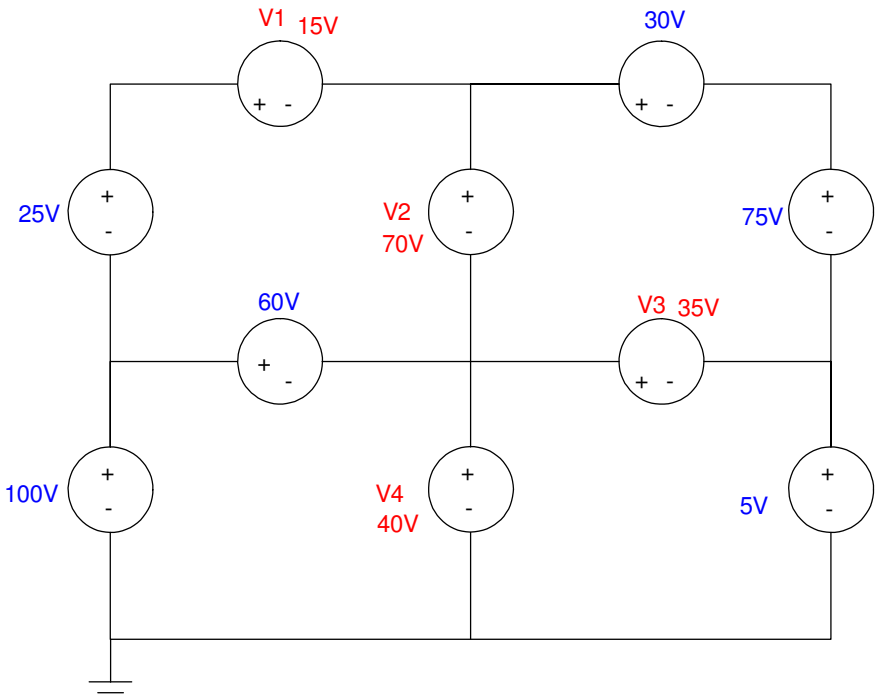
2) Use conservation of voltage to determine the unknown voltages

- V1 = 10V
- V2 = 70V
- V3 = 60V
- V4 = 50V

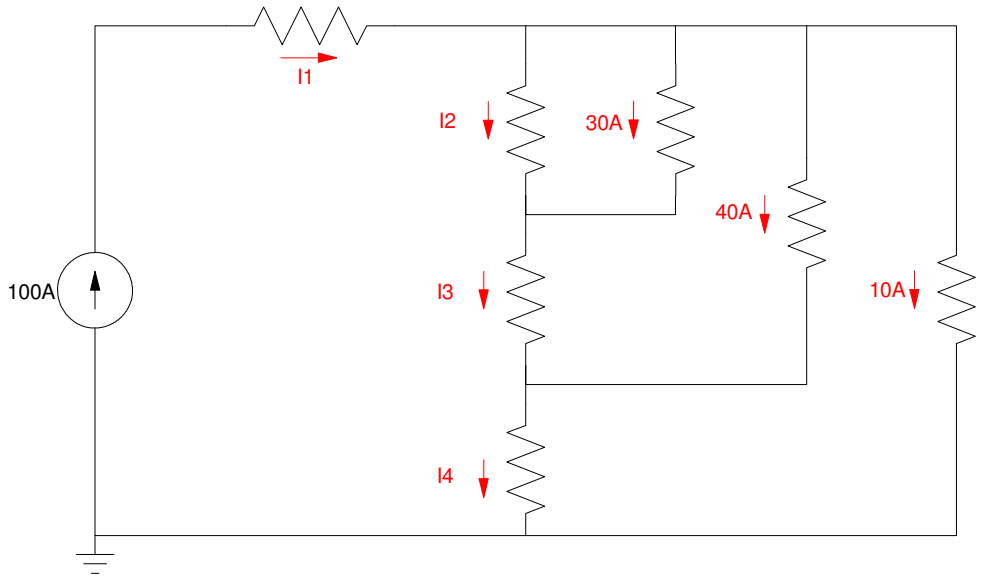


3) Use conservation of voltage to determine the unknown voltages

- V1 = 15V
- V2 = 70V
- V3 = 35V
- V4 = 40V



4) Use conservation of current to determine the unknown currents



- I1 = 100A
- I2 + 30A + 40A + 50A = 100A

  I2 = 20A
- I2 + 30A = I3

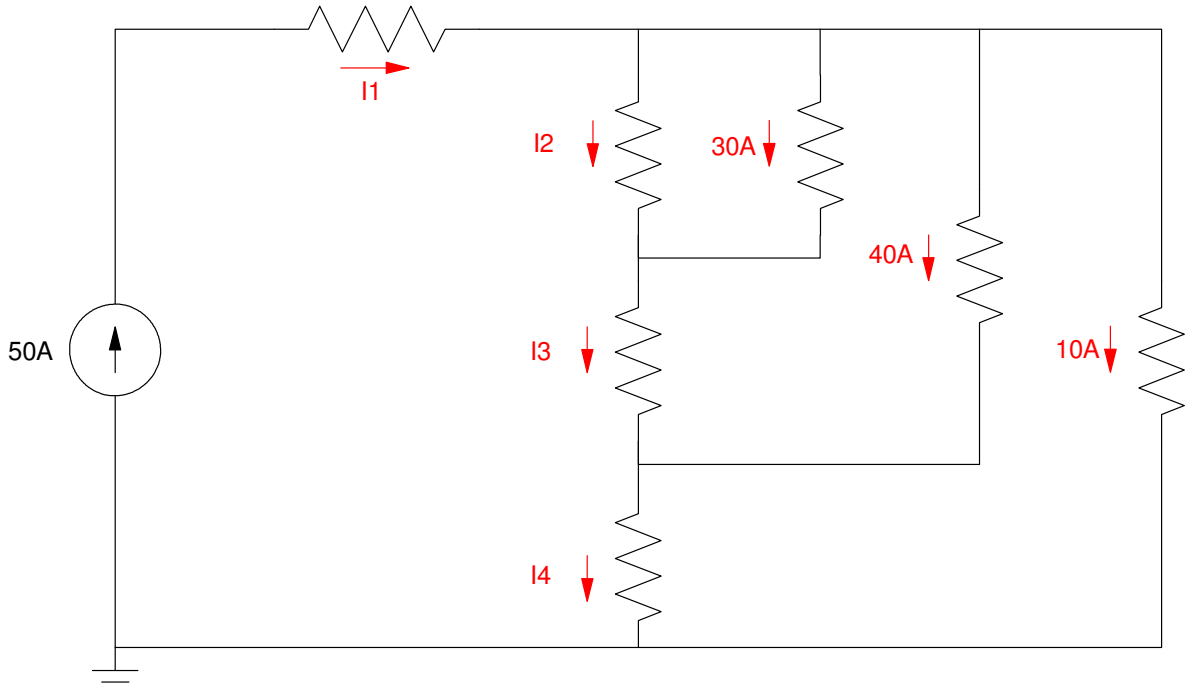
  I3 = 50A
- I3 + 40A = I4

  I4 = 90A

ans

- I1 = 100A
- I2 = 20A
- I3 = 50A
- I4 = 90A

5) Change the 100A source to 50A. Use conservation of current to determine the unknown currents. (note: some of the currents may be negative).



- I1 = 50A
- I2 + 30A + 40A + 10A = 50A

  I2 = -30A
- I2 + 30A + I3

  I3 = 0A
- I3 + 40A = I4

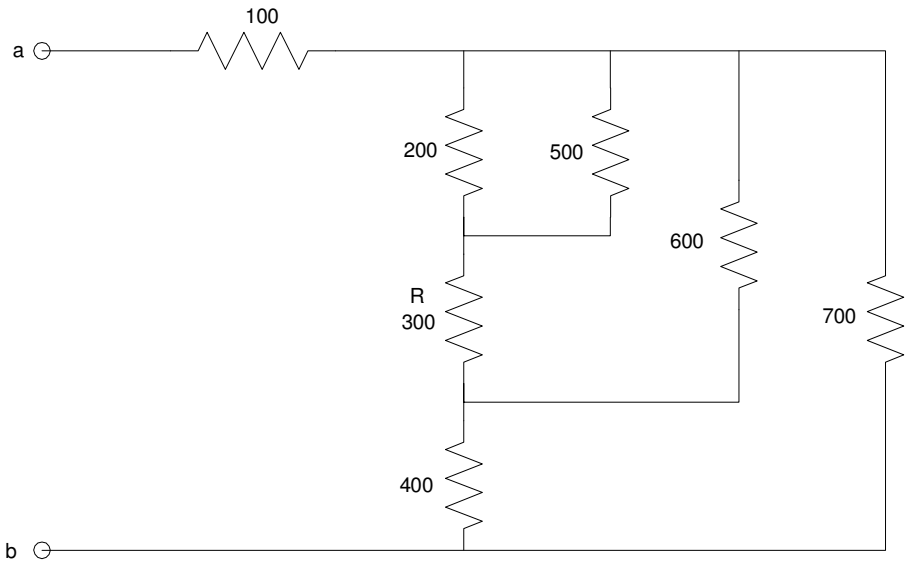
  I4 = 40A

answer:

- I1 = 50A
- I2 = -30A
- I3 = 0A
- I4 = +40A

Resistors in Series and Parallel

6) Assume R = 300. Determine the total resistance, Rab



Simplify by combining resistors

500 || 200 = 142.85 Ohms

142.85 + 300 = 442.85 Ohms

442.85 || 600 = 254.79 Ohms

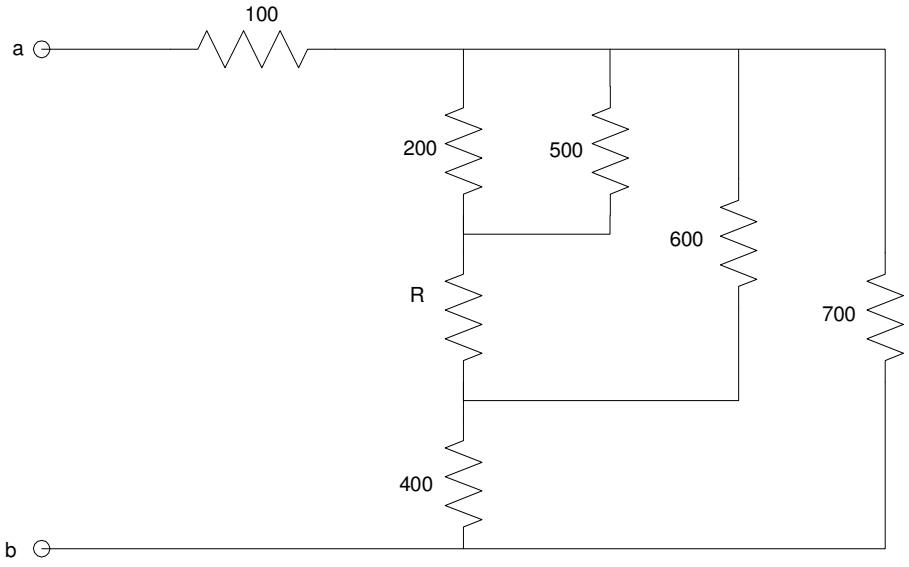
254.79 + 400 = 654.79 Ohms

654.79 || 700 = 338.32 Ohms

338.32 + 100 = 438.32 Ohms

answer: Rab = 438.32 Ohms

7) Assume the total resistance is Rab = 400 Ohms. Determine R.



The total resitance is 400 Ohms. That means everything to the right is 300 Ohms.

The 700 Ohm resistor is in parallel with everything else

$$\frac{1}{700} + \frac{1}{R_b} = \frac{1}{300}$$

$$R_b = 525\Omega$$

The 400 Ohm resistor is in series, so Rc = 125 Ohms

The 600 Ohm resistor is in parallel, so

$$\frac{1}{125} = \frac{1}{600} + \frac{1}{R_d}$$

$$R_d = 157.89\Omega$$

The 500 is in parallel with 200 Ohms

$$500 \parallel 200 = 142.85 \text{ Ohms}$$

R is in series, so

$$R + 142.85 = 157.89$$

R = 15.04 ohms