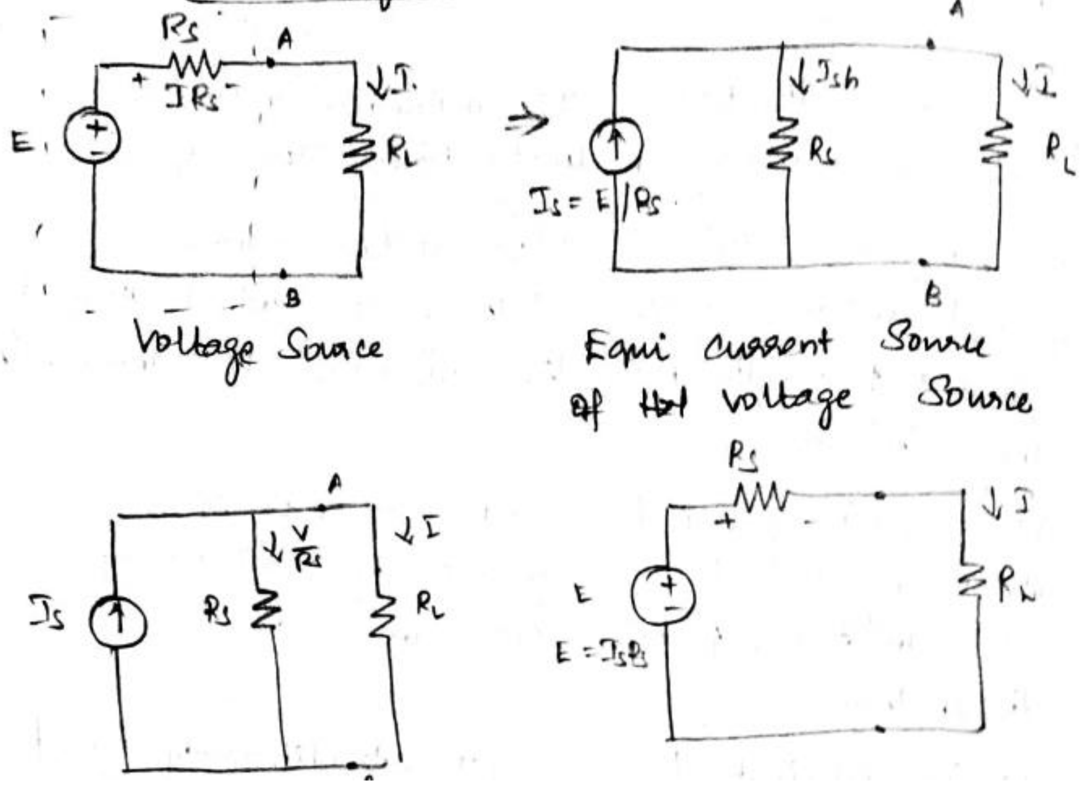
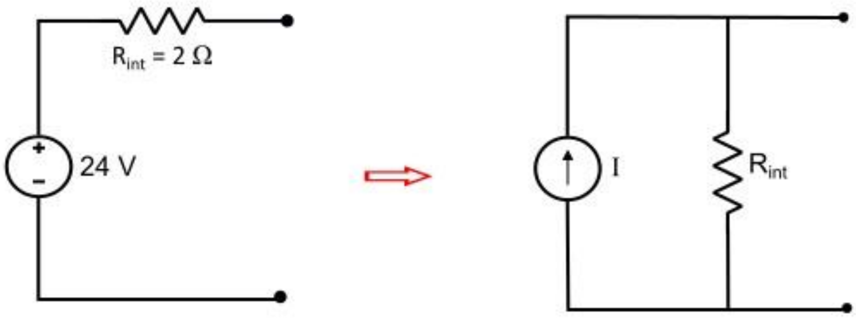
Source Transformation :-



Convert a voltage source of 24 V having a series internal resistance of 2 Ω into an equivalent current source.

Solution



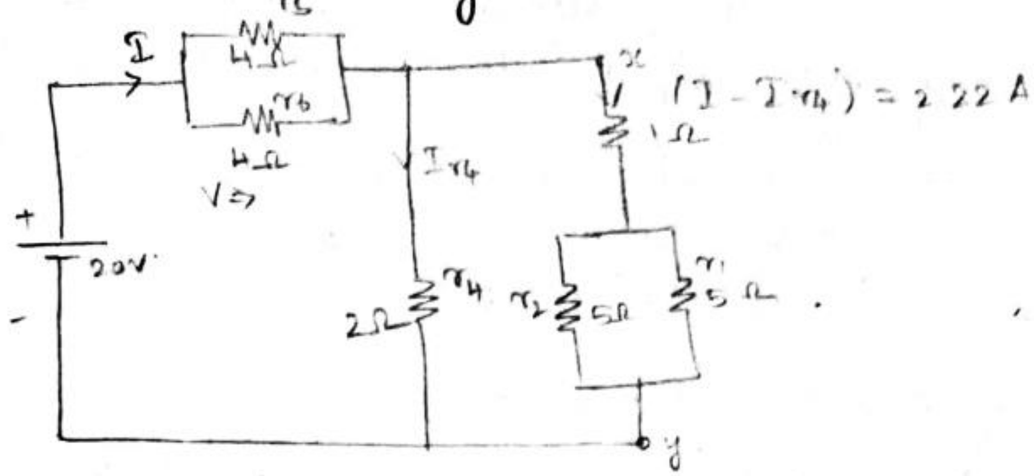
Here, the source current of equivalent current source is

I=V/Rint=24/2=12A

The internal resistance R_{int} of the equivalent current source has the same value as the original voltage source, thus

Rint=2Ω

Find the voltage across 1Ω resistor and power loss across 2Ω resistor in Fig



Equivalent resistance of r_1 and r_2.

$$r_1 || r_2 = 2.5\Omega.$$

$$R_{x-y} = 2.5 + 1 = 3.5\Omega.$$

$$r_4 || R_{xy} = \frac{1}{3.5} + \frac{1}{2} = 1.27\Omega$$

$$r_5 || r_6 = 2\Omega$$

$$R_{eq} = 2 + 1.27 = 3.27.$$

$$I = \frac{V}{R} = \frac{20}{3.27} = 6.12A.$$

The current throu' r_4

$$I_{r4} = I \times \frac{R_{x-y}}{R_{x-y} + r_4} = 6.12 \times \frac{3.5}{3.5+2}$$

$$= 3.9A.$$

Power loss in 2Ω.

$$P = I^2R = (3.9)(3.9)^2 \times 2$$

$$= 30.4\,W$$

$$V_{x\cdot y} \Rightarrow 20 - (2 \times 3.9)\ 20 - (6.12 \times 2)$$

$$= 7.76\,V$$

$$V_{r3} = 7.76 - (2.22 \times 2.5)$$

$$= 2.21\,V$$