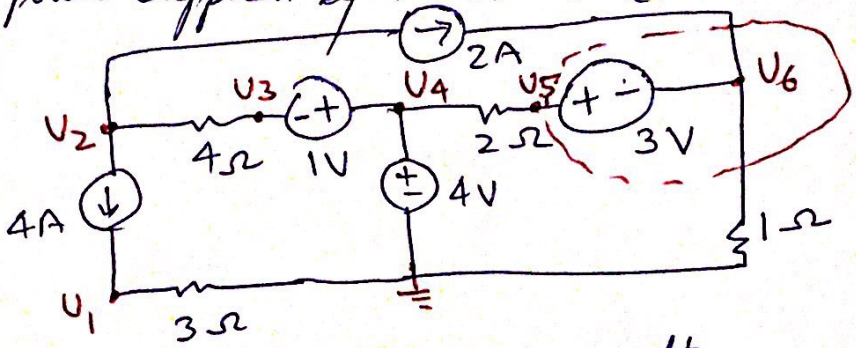
(Intelligent)

Prob 4.23 Nodal Analysis

(7th Ed pp 152 HRD)

Find the power supplied by the 2A source.



Solution: Label ref node and node voltages

By insp $V_4 = 4V$

Now $V_4 - V_3 = 1$

So $V_4 - 1 = V_3$ or $V_3 = 3V$

At the supernode $(V_5 - V_6)$:

$$2 - \frac{V_6}{1} - \frac{V_5 - V_4}{2} = 0, \text{ or } V_6 + \frac{V_5 - 4}{2} = 2$$

$$2V_6 + V_5 - 4 = 4 \text{ or } V_5 + 2V_6 = 8 \quad -(A)$$

At node 1; $\frac{V_1}{3} = 4$ or $V_1 = 12V$

At node 2, $+4 + 2 + \frac{V_2 - V_3}{4} = 0$

$$\frac{V_2 - V_3}{4} = -6, \quad V_2 = -24 + 3$$

$$V_2 = -21V$$

Now $V_5 - V_6 = 3$ —(B)

$V_5 + 2V_6 = 8$ —(A)

$-3V_6 = -5$ $\quad V_6 = 1.667$

Hence $V_6 - V_2 = 1.667 + 21 = 22.667$ and $P = VI$

$P = 22.667 \times -2 = -45.33W$ or $45.33W$ supplied