THIS IS THE ONLY EXAMPLE I AM GIVEN ON NODAL ANALYIS.

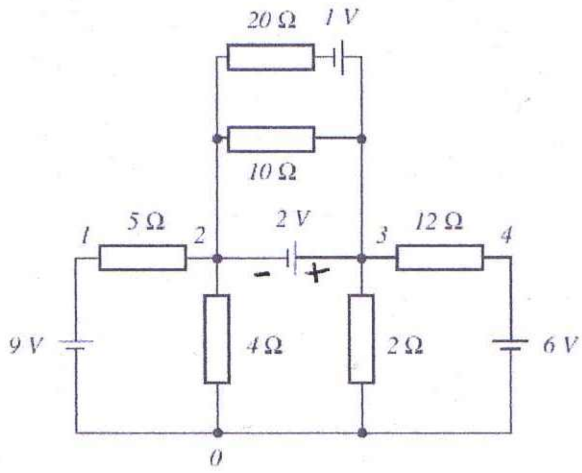

FIG. 14

THIS EXAMPLE IS TO DETERMINE THE CURRENT FLOWING IN THE 2 V BATTERY.

Solution

Although there are other components connected in parallel to it, we still have an ideal voltage source connected directly between two nodes. This means that the voltage V_{32} is pinned at 2 V, irrespective of what is happening elsewhere in the circuit. In fact we can go on to immediately state that:

current in 10 Ω resistor is $(2 \div 10) = 0.2$ A

and

current in 20 Ω resistor is $((2-1) \div 20) = 0.05$ A

Thus current flowing into node 2 from the 20 Ω and 10 Ω resistors is 0.25 A.

To solve for the remainder of the circuit we make node '2' and '3' a super node and apply KCL to it:

$$\frac{9-V_{20}}{5} - \frac{V_{20}}{4} - \frac{V_{30}}{2} + \frac{6-V_{30}}{12} = 0$$

Multiplying by 60 gives:

$$108 - 12V_{20} - 15V_{20} - 30V_{30} + 30 - 5V_{30} = 0$$
$$27V_{20} + 35V_{30} = 138 \qquad (1)$$

We also know

$$V_{30} - V_{20} = 2 \qquad (2)$$

Adding $27 \times$ (2) to (1):

$$27V_{30} + 35V_{30} = 138 + 54$$
$$62V_{30} = 192$$
$$V_{30} = 3.097 \text{ volts}$$

Thus $\quad V_{20} = 3.097 - 2 = 1.097$ volts

Current in 5 Ω RESISTOR $= \dfrac{9 - 1.097}{5} = 1.518$ A (INTO NODE 2)

CURRENT IN 4 Ω RESISTOR $= \dfrac{1.097}{4} = 0.274$ A (OUT OF NODE 2)

CURRENT IN FROM 5 Ω + CURRENT IN FROM 20 Ω AND 10 Ω − CURRENT OUT FROM 4 Ω = 1.581 + 0.25 − 0.274 = 1.557 A

SO THERE IS 1.557 A FLOWING INTO −ve TERMINAL.