EECE202 NETWORK ANALYSIS I Dr. Charles J. Kim

Class Note 16:
Node-Voltage Method vs. Mesh-Current Method - which is better and when?

General (meaning "not always true") selection rule:

Pick one which results in fewer equations by comparing the number of:
(a) unknown node voltages and
(b) unknown mesh currents.

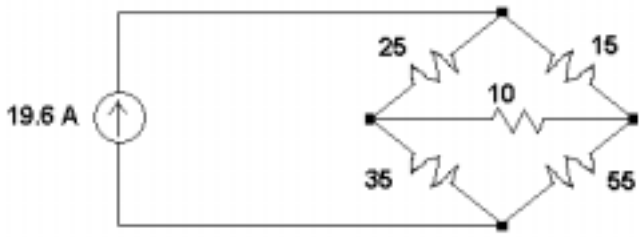
Adage

"Some time spent thinking about the circuit analysis problem in relation to the various approaches (node and mesh included) is time well spent."

CASE 1:

The question with the circuit below is to find the power dissipated in the 10 Ω resistor. Which method, node or mesh, do you want to pick?

Let's apply the general rule to select a better approach.



SOLUTION

(1) Strategy? : Find the current through the 10 Ω resistor (i_{10}) since $P_{10}=(i_{10})^2(10)$.

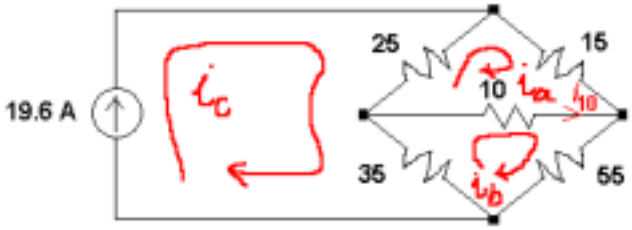
(2) Nodes: 3 + reference
Meshes: 3 but (one is already known with 19.6)

(3) Verdict: Mesh-Current Method.

Let's marks the mesh currents as follows.

See that the mesh current i_c is the same as the source current, 19.6.

Also, $i_{10} = i_b - i_c$



(4) Calculation.

@ Mesh a: $25(i_a - 19.6) + 15i_a + 10(i_a - i_B) = 0$ --------> $5i_a - i_b = 49$ -------(1)

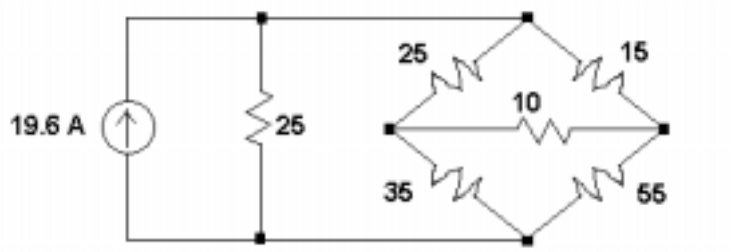
@ Mesh b: $35(i_b - 19.6) + 10(i_b - i_a) + 55i_b = 0$ -----> $-10i_a + 100i_b = 686$ -------- (2)

By (1)*2 + (2): $98i_b = 784$, therefore, i_b=8 and i_a=11.4

Then $i_{10}= i_b - i_a$=-3.4.

Finally, P10 = $(i_{10})^2(10)$=115.6 [W].

CASE 2: From the case 1, we inserted a 25Ω resistor and the question again is to find the power dissipated in the 10 Ω resistor. What method are you going to apply?



SOLUTION:
Nodes: 3 + Reference (3 variables)
Meshes: 4-1 =3 (3 variables).
Verdict: ?????