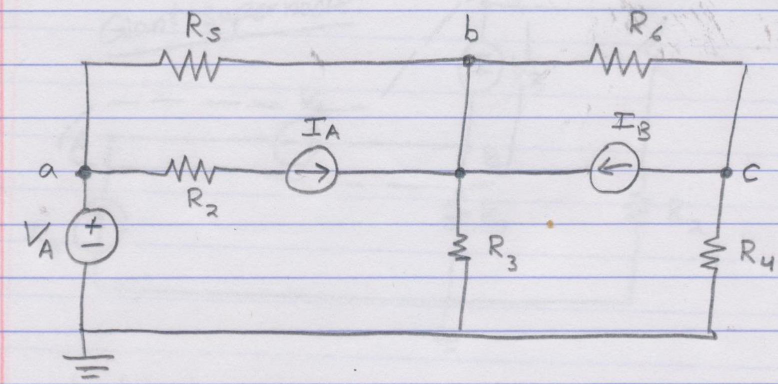
Q1:
Do both

Solve for V_A, V_B, V_C

Warm-Up
(Spring 2004)



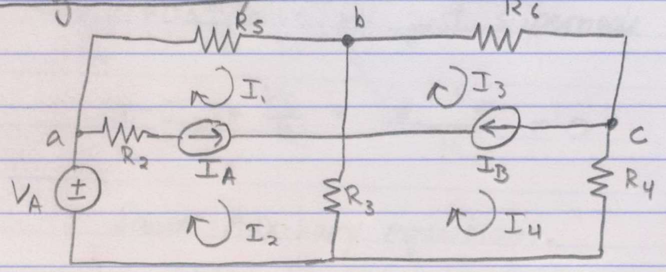
Using Nodal Analysis

Nodal at b: $-I_A + \dfrac{V_b - V_a}{R_5} + \dfrac{V_b - V_c}{R_6} - I_B + \dfrac{V_b}{R_3} = 0$

Nodal at c: $\dfrac{V_c}{R_4} + I_B + \dfrac{V_c - V_B}{R_6} = 0$

Two equations, two unknowns ($V_B + V_c$)

Using Mesh Analysis:



Supermesh 1+2: $-V_A + I_1 R_5 + (I_2 - I_4) R_3 = 0$

Auxiliary: $I_A = I_2 - I_1$

Supermesh 3+4: $(I_4 - I_2) R_3 + I_3 R_6 + R_4 I_4 = 0$

Auxiliary: $I_B = I_3 - I_4$

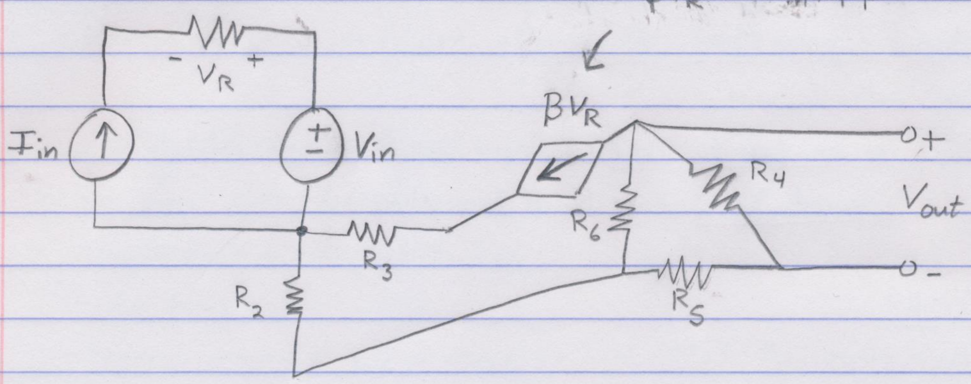
Four equations, four unknowns (I_1, I_2, I_3, I_4).
Don't forget auxiliary equations!

Q2: Any way

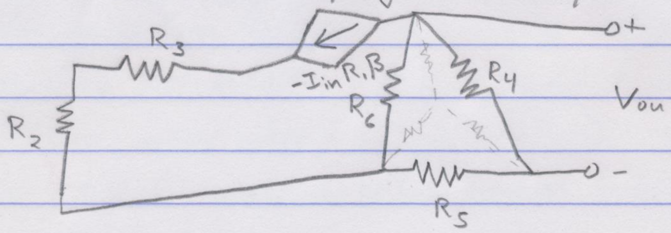
Fall 2011 MT1 - Maharbiz

$V_R = -I_{in} R_1$

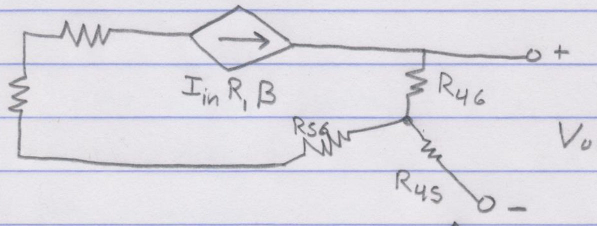
$\beta V_R = -I_{in} R_1 \beta$



The left loop does not contribute any current to the rest of the circuit. We can safely ignore it in any KCL.



Wye-Delta $\Longrightarrow$



no current through this branch

So V_{out} is voltage across R_{46}

$$\Longrightarrow V_{out} = \underbrace{I_{in} R_1 \beta}_{\text{current through } R_{46}} R_{46}$$

$$= \boxed{\frac{I_{in} R_1 \beta R_4 R_6}{R_4 + R_5 + R_6} \, [V]}$$