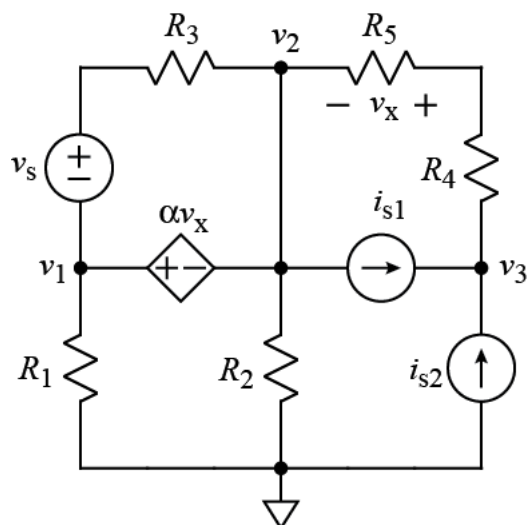**Ex:**

For the circuit shown, write three independent equations for the node-voltages, v_1, v_2, and v_3. The quantity v_X must not appear in the equations. Only component and source names may appear in answer.

SOL'N:

Supernode between V_1 and V_2:

① $(V_1 - V_2) = \alpha V_x$

$V_x = -\dfrac{(V_2 - V_3)R_5}{R_4 + R_5}$

①$(V_1 - V_2) = -\alpha \dfrac{R_5(V_2 - V_3)}{R_4 + R_5}$

② $\dfrac{V_1}{R_1} + \dfrac{(V_1 + V_S - V_2)}{R_3} - \dfrac{(V_1 + V_S - V_2)}{R_3} + \dfrac{V_2}{R_2} + I_{s1} + \dfrac{(V_2 - V_3)}{R_4 + R_5} = 0$

at node V_3:

③ $-I_{s1} - I_{s2} - \dfrac{(V_2 - V_3)}{R_4 + R_5} = 0$