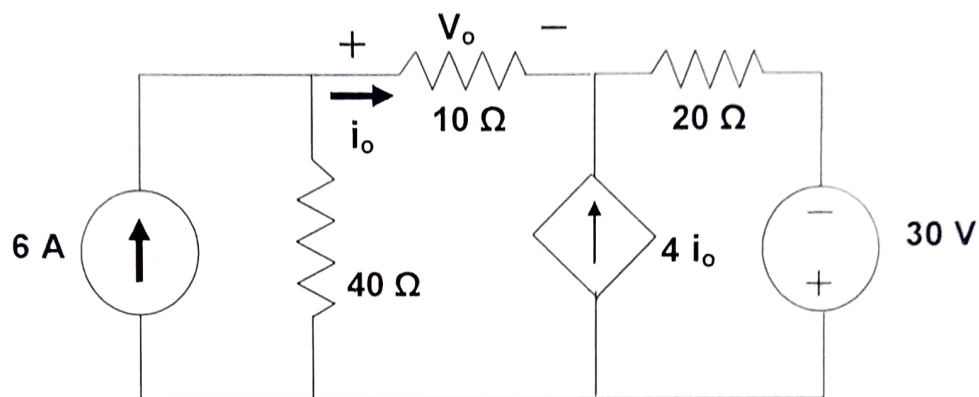Name: Muhammad Umer

Total Marks   10

Regn Number / Section: 345834   12-C
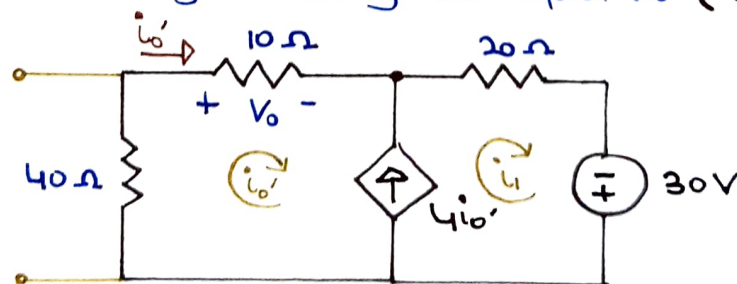
Home Assignment No 2 : Superposition

Use superposition to find i_0 and v_0. Please include all calculations to claim full credits. If additional space is required use A4 size paper only. Upload the hand written solution with file name "HA No 2" and in pdf.

We calculate the effects of individual sources and then add them to get i_0.

→ Killing 6A source by making it open: (i_0' of 30V)

Applying Mesh analysis:

Mesh 1 (outside Loop): $40(i_0') + 10(i_0') + 20(i_1) - 30 = 0$

: $50\,i_0' + 20\,i_1 = 30$ ①

Super mesh   : $-i_0' + i_1 = 4i_0'$

: $5i_0' - i_1 = 0$ ②

Solving ① and ②

$$\boxed{i_o' = 0.2\,A}$$

→ Killing 30V source by shorting it : (i_o'' of 6A)
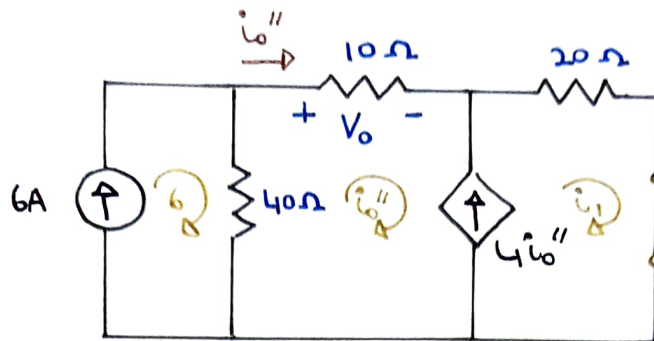
Applying Mesh analysis :

Mesh 1 : $40(i_o'' - 6) + 10(i_o'') + 20(i_1) = 0$

$$\underline{50\,i_o'' + 20\,i_1 = 240}\quad ①$$

Supermesh : $i_1 - i_o'' = 4i_o''$

$$\underline{5i_o'' - i_1 = 0}\quad ②$$

Solving ① and ②

$$\boxed{i_o'' = 1.6\,A}$$

Adding individual effects of either source,

$$i_o = i_o' + i_o''$$
$$= 0.2 + 1.6$$
$$\boxed{i_o = 1.8\,A}$$

As i_o goes through the 10 Ω resistor, Voltage V_o across it can be calculated by Ohm's Law.

$$V_o = i_o R$$
$$V_o = (1.8)(10)$$
$$\boxed{V_o = 18\,V}$$