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MAXWELL'S LOOP CURRENT METHOD :

Loop 1): ABGHA :

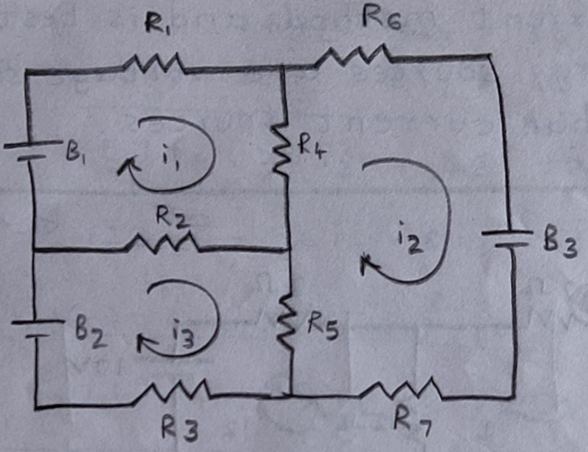
$$-5i_1 - 3(i_1 - i_2) - 5 + 20 = 0$$

Loop 2): BCFGB :

$$-4i_2 + 5 - 2(i_2 - i_3) + 5 + 5 - 3(i_2 - i_1) = 0$$

Loop 3): CDEFC :

$$-8i_3 - 30 - 5 - 2(i_3 - i_2) = 0$$



Loop 1 :

$$B_1 - i_1 R_1 - R_4(i_1 - i_2) - R_2(i_1 - i_3) = 0$$

Loop 2 :

$$-i_2 R_6 - B_3 - i_2 R_7 - R_5(i_2 - i_3) - R_4(i_2 - i_1) = 0$$

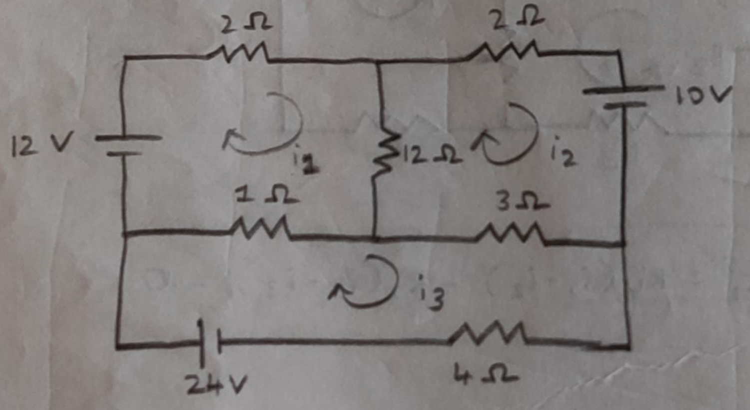
Loop 3 :

$$B_2 - R_2(i_3 - i_1) - R_5(i_3 - i_2) - i_3 R_3 = 0$$

18.9.24

MAXWELL'S LOOP CURRENT METHOD :

* This method which is particularly well suited to coupled circuit solutions employ a system of loop or mesh currents instead of branch currents as in Kirchoff's Law.
* Here the current in different measures are assigned continuous paths, so that they do not split at a junction into branch currents. This method eliminates a great deal of tedious work involved in the branch current method and is best suited when energy sources are voltage sources rather than current sources.



Loop 1 :)

$$-2i_1 - 12(i_1 - i_2) - 1(i_1 - i_3) + 12 = 0$$

$$-2i_1 - 12i_1 + 12i_2 - i_1 + i_3 + 12 = 0$$

$$-15i_1 + 12i_2 + i_3 = -12$$

$(\times -)$

$$15i_1 - 12i_2 - i_3 = 12 \rightarrow (1)$$

Loop 2 :)

$$-2i_2 - 10 - 3(i_2 - i_3) - 12(i_2 - i_1) = 0$$

$$-2i_2 - 10 - 3i_2 + 3i_3 - 12i_2 + 12i_1 = 0$$

$$12i_1 - 17i_2 + 3i_3 = 10 \rightarrow ②$$

Loop 3 :)

$$-1(i_3 - i_1) - 3(i_3 - i_2) - 4i_3 + 24 = 0$$

$$-i_3 + i_1 - 3i_3 + 3i_2 - 4i_3 + 24 = 0$$

$$i_1 + 3i_2 - 8i_3 = -24 \rightarrow ③$$

① × 3 => $45i_1 - 36i_2 - \cancel{3i_3} = 36$

② => $12i_1 - 17i_2 + \cancel{3i_3} = 10$

$$57i_1 - 53i_2 = 46 \rightarrow ④$$

① × 8 => $120i_1 - 96i_2 - 8i_3 = 96$

③ => $\underset{(-)}{} i_1 \underset{(-)}{+} 3i_2 \underset{(+)}{-} 8i_3 = \underset{(+)}{-24}$

$$119i_1 - 99i_2 = 120 \rightarrow ⑤$$

$$\boxed{i_1 = 2.72\text{ A}}$$

$$\boxed{i_2 = 2.05\text{ A}}$$

Sub in ③ :

$$2.72 + 3(2.05) - 8i_3 = -24$$

$$\boxed{i_3 = 4.11\text{ A}}$$

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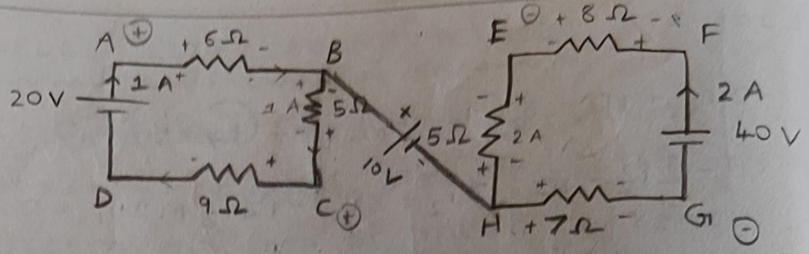
Q)



$V_{CE} = ?$

$V_{AG} = ?$

$R_{eff} = 6 + 5 + 9 = 20\ \Omega$

$I = \frac{V}{R_{eff}} = \frac{\cancel{20}}{\cancel{20}} = 1\ A$

$R_{eff} = 8 + 5 + 7 = 20\Omega$

$I = \frac{V}{R_{eff}} = \frac{\cancel{40}}{\cancel{20}} = 2\ A$

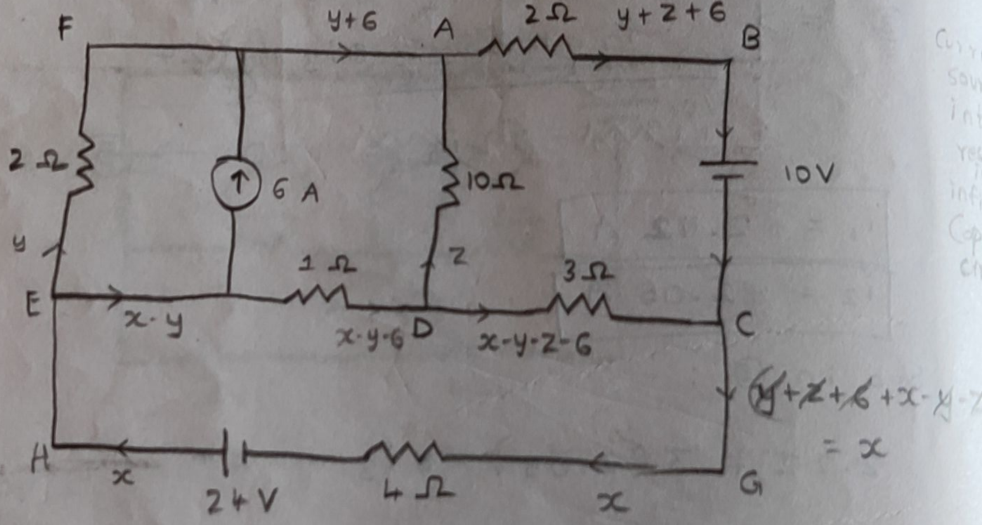
$V_{CE} = \cancel{-10V} + 10V - 5\ V$

$V_{CE} = -5\ V$ ($\because$ Change the Terminal) $C^{\ominus}, E^{\oplus}$

$V_{AG} = 6\ V + 10\ V + 14\ V$

$= 30\ V$ ($\because$ $A^{\oplus}, G^{\ominus}$)

Q)



Loop 1 : ABCDA :

$-2(y+z+6) - 10 + 3(x-y-z-6) - 10z = 0$

$-2y - 2z - 12 - 10 + 3x - 3y - 3z - 18 - 10z = 0$

$3x - 5y - 15z = 40 \rightarrow 1$

Loop 2: (FADEF):

$$+10(z) + 1(x - y - 6) - 2y = 0$$

$$10z + x - y - 6 - 2y = 0$$

$$x - 3y + 10z = 6 \rightarrow (2)$$

Loop 3: (ECGHE)

$$-1(x - y - 6) - 3(x - y - z - 6) - 4x + 24 = 0$$

$$-x + y + 6 - 3x + 3y + 3z + 18 - 4x + 24 = 0$$

$$-8x + 4y + 3z = -48 \rightarrow (3)$$

Solving (1) (2) & (3);

$$\boxed{\begin{aligned} x &= 4.102\text{ A} \\ y &= -3.214\text{ A} \\ z &= -0.774\text{ A} \end{aligned}}$$

4 SUPERPOSITION THEOREM:

* Circuit should have more than one loop and more than one emf.

Steps: