A:

$$\begin{bmatrix} 1 & 0 & 0 & 1 \\ 0 & 1 & -1 & 1 \\ 2 & 3 & 0 & 4 \\ 0 & 3 & 6 & 0 \end{bmatrix} \begin{bmatrix} I_1 \\ I_2 \\ I_3 \\ I_4 \end{bmatrix} = \begin{bmatrix} 12 \\ 0 \\ 0 \\ 0 \end{bmatrix}$$

B:

$$\begin{bmatrix} 1 & 0 & 0 & -1 \\ 0 & 1 & -1 & 1 \\ 2 & -3 & 0 & -4 \\ 0 & 3 & 6 & 0 \end{bmatrix} \begin{bmatrix} I_1 \\ I_2 \\ I_3 \\ I_4 \end{bmatrix} = \begin{bmatrix} 12 \\ 0 \\ 0 \\ 0 \end{bmatrix}$$

C:

$$\begin{bmatrix} 1 & 0 & 0 & 1 \\ 0 & 1 & 1 & -1 \\ 2 & 3 & 0 & -4 \\ 0 & 3 & -6 & 0 \end{bmatrix} \begin{bmatrix} I_1 \\ I_2 \\ I_3 \\ I_4 \end{bmatrix} = \begin{bmatrix} -12 \\ 0 \\ 0 \\ 0 \end{bmatrix}$$

D:

$$\begin{bmatrix} 1 & 0 & 0 & 1 \\ 0 & 1 & -1 & 1 \\ 2 & 3 & 0 & -4 \\ 0 & 3 & 6 & 0 \end{bmatrix} \begin{bmatrix} I_1 \\ I_2 \\ I_3 \\ I_4 \end{bmatrix} = \begin{bmatrix} -12 \\ 0 \\ 0 \\ 0 \end{bmatrix}$$

Question 5:

For the circuit shown in Fig. Q5, let $R_1 = 2\ \Omega$, $R_2 = 3\ \Omega$, $R_3 = 6\ \Omega$, $R_4 = 4\ \Omega$, and $I_s = 12$ A. Let V_1 and V_2 denote the left and right node voltages, respectively. Which one of the following equations is obtained by applying Kirchhoff's Current Law (KCL) at node V_1?

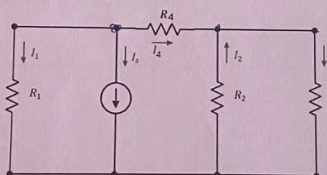


Fig. Q5

A:

$$\frac{V_1}{2} + \frac{V_1 - V_2}{4} = 12$$

B:

$$\frac{V_1}{2} + \frac{V_2 - V_1}{4} = -12$$

C:

$$\frac{V_1}{2} + \frac{V_1 - V_2}{4} = -12$$

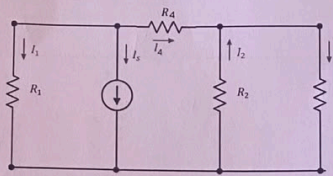
D: None of the above *E*:

$$\frac{V_1}{2} + \frac{V_1}{4} = 12$$

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Question 3:

For the circuit shown in Fig. Q3, let $R_1 = 2\ \Omega$, $R_2 = 3\ \Omega$, $R_3 = 6\ \Omega$, $R_4 = 4\ \Omega$, and $I_s = 12$ A. Let V_1 and V_2 denote the left and right node voltages, respectively. After replacing R_2 and R_3 by their parallel equivalent, which one of the following voltage-divider relations correctly gives V_2 in terms of V_1?



$\frac{3*6}{3+6} = 2$

Fig. Q3

A:

$$V_2 = \frac{R_2 \parallel R_3}{R_4 + (R_2 \parallel R_3)} V_1 = \frac{1}{3} V_1$$

B:

$$V_2 = \frac{R_4}{R_4 + (R_2 \parallel R_3)} V_1 = \frac{2}{3} V_1$$

C:

$$V_2 = \frac{R_4 + (R_2 \parallel R_3)}{R_2 \parallel R_3} V_1 = 3V_1$$

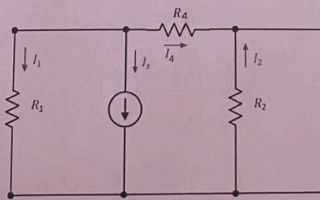
D:

$$V_2 = \frac{R_2 + R_3}{R_4 + R_2 + R_3} V_1 = \frac{9}{13} V_1$$

E: None of the above

Question 4:

For the circuit shown in Fig. Q4, let $R_1 = 2\ \Omega$, $R_2 = 3\ \Omega$, $R_3 = 6\ \Omega$, $R_4 = 4\ \Omega$, and $I_s = 12$ A. Which one of the following matrix equations correctly represents the minimum set of independent KCL and KVL equations required to determine the unknown branch currents?



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Fig. Q4

Question 1:

For the circuit shown in Fig. Q1, let $R_1 = 2\ \Omega$, $R_2 = 3\ \Omega$, $R_3 = 6\ \Omega$, $R_4 = 4\ \Omega$, and $I_s = 12$ A. Using current division successively, first between R_1 and the branch containing R_4 and $R_2 \parallel R_3$, and then between R_2 and R_3, determine the current I_3 in the direction shown.

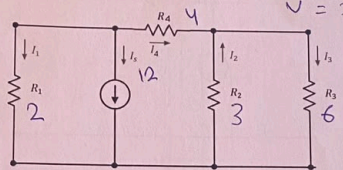


Fig. Q1

A: 1 A *B*: 2 A *C*: −1 A *D*: None of the above *E*: −2 A

Question 2:

For the circuit shown in Fig. Q2, let $R_1 = 2\ \Omega$, $R_2 = 3\ \Omega$, $R_3 = 6\ \Omega$, $R_4 = 4\ \Omega$, and $I_s = 12$ A. Which one of the following equations is obtained by applying Kirchhoff's Voltage Law (KVL) clockwise around the loop containing R_1, R_4, and R_3?

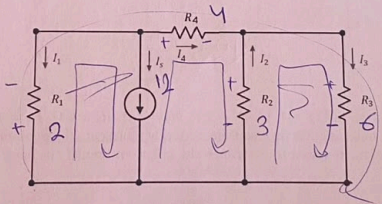


Fig. Q2

A:

$$2I_1 - 4I_4 + 6I_3 = 0$$

B:

$$2I_1 + 4I_4 - 3I_2 = 0$$

C: None of the above *D*:

$$2I_1 + 4I_4 - 6I_3 = 0$$

E:

$$2I_1 + 4I_4 + 6I_3 = 0$$

$$2I_1 - 4I_4 - 6I_3 = 0$$

$$\begin{bmatrix} 1 & 0 & 0 & 1 \\ 0 & 1 & -1 & 1 \\ 2 & 3 & 0 & -4 \\ 0 & 3 & 6 & 0 \end{bmatrix} \begin{bmatrix} I_1 \\ I_2 \\ I_3 \\ I_4 \end{bmatrix} = \begin{bmatrix} -12 \\ 0 \\ 0 \\ 0 \end{bmatrix}$$

$$I_3 = -1 \text{ A}$$

$$\frac{V_1}{2} + \frac{V_1 - V_2}{4} = -12$$

$$V_2 = \frac{R_2 \parallel R_3}{R_4 + (R_2 \parallel R_3)} V_1 = \frac{1}{3} V_1$$

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