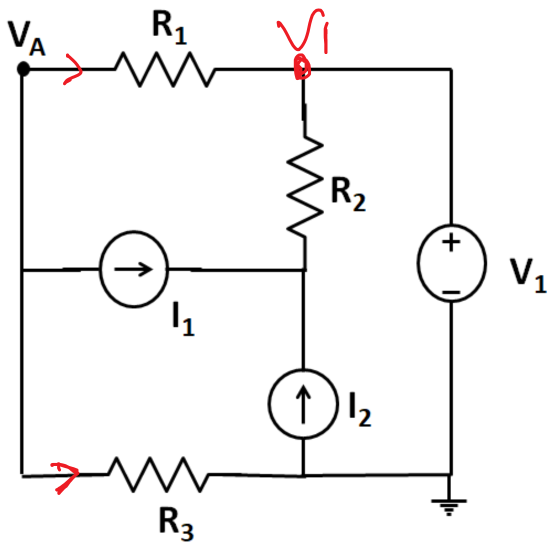
Solutions

10 January 2022 14:43

In the following circuit, find the node voltage V_A (in Volt). Given R_1= 8 Ω, R_2= 7 Ω, R_3= 8 Ω, V_1= 9 V, I_1= 6 A, I_2= 6 A.

From <https://lms.bennett.edu.in/mod/quiz/review.php?attempt=217221>



Nodal Analysis at node V_A

$$\frac{V_A - V_1}{R_1} + I_1 + \frac{V_A - 0}{R_3} = 0$$

$$\frac{V_A - 9}{8} + 6 + \frac{V_A}{8} = 0$$

or, $V_A - 9 + 48 + V_A = 0$

or, $2V_A = -39$

$V_A = -19.5\ V$

In the following circuit, find the voltage V_0 (in Volt) across the resistor R_L. Given R_1= 6 kΩ, R_2 = 8 kΩ, R_3= 7 kΩ, R_L= 7 kΩ, V_1= 9 V, V_2= 10 V.

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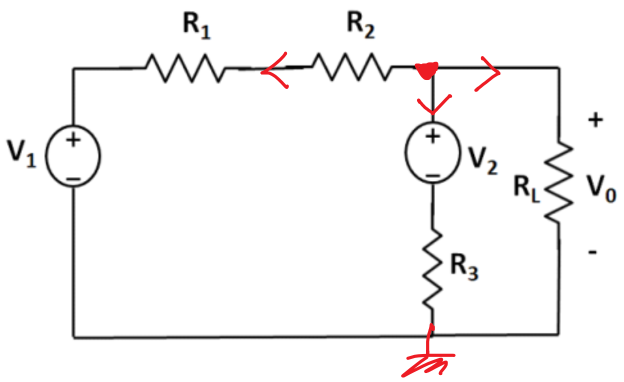

$$\frac{V_0 - V_1}{R_1 + R_2} + \frac{V_0 - V_2}{R_3} + \frac{V_0}{R_L} = 0$$

$$\frac{V_0 - 9}{6 + 8} + \frac{V_0 - 10}{7} + \frac{V_0}{7} = 0$$

or, $V_0 - 9 + 2V_0 - 20 + 2V_0 = 0$

or, $5V_0 = 29$

$V_0 = 5.8V$

In the following circuit, find the voltage V_2 (in Volt) across the resistor R_2. Given R_1= 7 Ω, R_2= 6 Ω, R_3= 6 Ω, R_4= 6 Ω, I_1= 6 A, V_1= 6 V.

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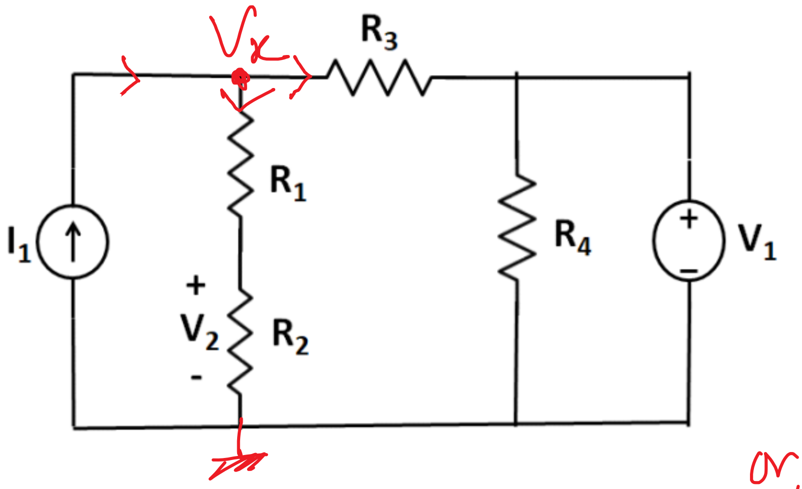

$$\frac{V_x}{R_1+R_2} + \frac{V_x - V_1}{R_3} - I_1 = 0$$

$$\frac{V_x}{7+6} + \frac{V_x - 6}{6} - 6 = 0$$

or, $$\frac{V_x}{13} + \frac{V_x - 6}{6} - 6 = 0$$

or, $6V_x + 13V_x - 78 - 468 = 0$

or, $19V_x = 546$

$V_x = 28.7368\ V$

$$V_2 = \frac{R_2}{R_1+R_2} V_x = 28.7368 \times \frac{6}{6+7} = 13.263\ V$$

The charge flowing through a conductor is given by q = 47t *Sin*(4πt) mC in 0.5 s. Calculate the current (in mA) flowing through the conductor at t = 0.5 s.

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$$i = \frac{dq}{dt} = \frac{d}{dt}\left(47t \sin(4\pi t)\right)$$

$$= 47\sin(4\pi t) + 47t\,(4\pi)\cos(4\pi t)$$

$$i\Big|_{t=0.5s} = 0 + 47(0.5)(4\pi).\cos(2\pi)$$

$$= 295.16\ mA \quad (\text{considering } \pi = 3.14)$$

Consider three resistors each having a resistance of 114 Ω. Let R_S be the equivalent resistance when the resistances are connected in series. Similarly, R_P be the equivalent resistance when the resistances are connected in parallel.
The ratio RS/RP is equal to_____________.

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Ratio 9,

3 parallel resistor resistance $R/3$

3 series " " $3R$

$$\frac{R_S}{R_P} = \frac{3R}{R/3} = 9$$

A voltage source V_S= 7.9 V, and two resistors R_1= 5.3 Ω and R_L (in Ω) are connected in series to form a circuit. The maximum power (in Watt) that can be transferred to the load resistor R_L is Answer

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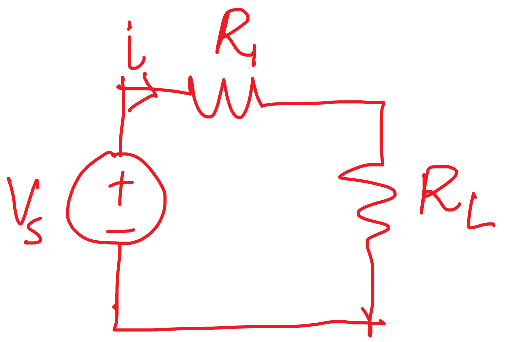

$$i = \frac{V_s}{R_1 + R_L}$$

For maximum power transfer

$$R_1 = R_L$$

$$i = \frac{V_s}{\;}$$

$2K_1$

Power dissipated by $R_L = i^2 R_L$

$$= \frac{V_s^2}{4R_1^2} R_1$$

$$= \frac{V_s^2}{4R_1} = \frac{7.9^2}{4 \times 5.3}$$

$$= 2.9438 \text{ mW}$$