

# GATE 2021 BM.29

EE23BTECH11010 - VENKATESH BANDAWAR\*

**Question:** In the circuit shown below,  $V_s = 100V$ ,  $R_1 = 30\Omega$ ,  $R_2 = 60\Omega$ ,  $R_3 = 90\Omega$ ,  $R_4 = 45\Omega$ ,  $R_5 = 30\Omega$ . The current flowing through resistor  $R_3$  is \_\_\_\_\_ A. (Gate 2022 BM)

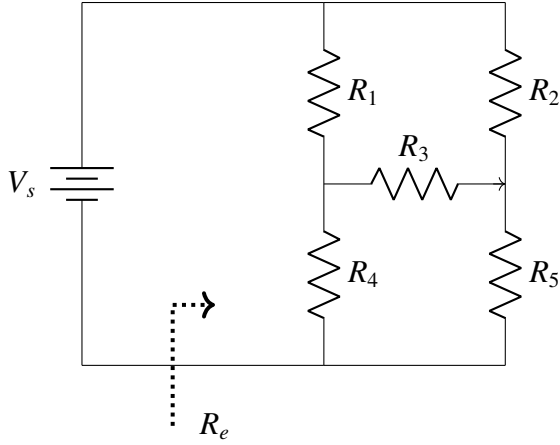


Fig. 1: Circuit Diagram

**Solution:**

Parameter	Value
$V_s$	100V
$R_1$	30Ω
$R_2$	60Ω
$R_3$	90Ω
$R_4$	45Ω
$R_5$	30Ω

TABLE I: Given Parameters

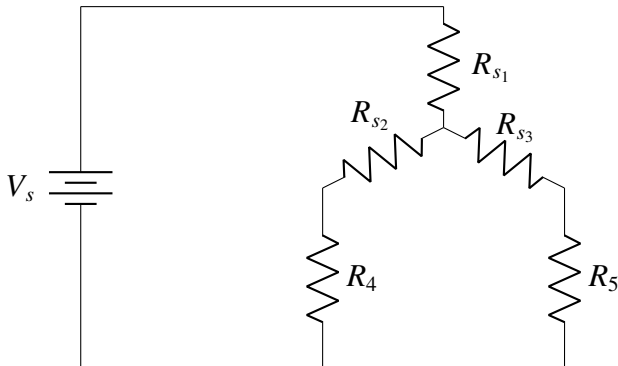


Fig. 2: circuit diagram

$$R_{s1} = \frac{R_1 R_2}{R_1 + R_2 + R_3} \quad (1)$$

$$= 10\Omega \quad (2)$$

$$R_{s2} = \frac{R_3 R_1}{R_1 + R_2 + R_3} \quad (3)$$

$$= 15\Omega \quad (4)$$

$$R_{s3} = \frac{R_2 R_3}{R_1 + R_2 + R_3} \quad (5)$$

$$= 30\Omega \quad (6)$$

$$R_e = R_{s1} + \frac{(R_{s2} + R_4)(R_{s3} + R_5)}{(R_{s2} + R_4) + (R_{s3} + R_5)} \quad (7)$$

$$= 40\Omega \quad (8)$$

$$I = \frac{V_s}{R_e} \quad (9)$$

$$= 2.5A \quad (10)$$

From Circuit Fig. 2

$$V_{R4} = \frac{(R_{s3} + R_5)}{(R_{s2} + R_4) + (R_{s3} + R_5)} I R_4 \quad (11)$$

$$= 56.25V \quad (12)$$

By KVL,

$$V_{R1} = V - V_{R4} \quad (13)$$

$$= 43.75V \quad (14)$$

By KCL,

$$I_{R3} = \frac{V_{R1}}{R_1} - \frac{V_{R4}}{R_4} \quad (15)$$

$$= 0.2083A \quad (16)$$