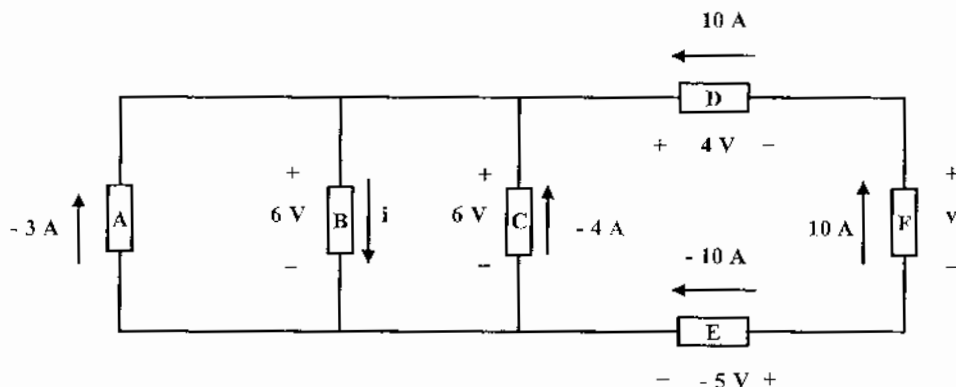


wlg
Due: Sept 6

Name _____
Print (last, first)

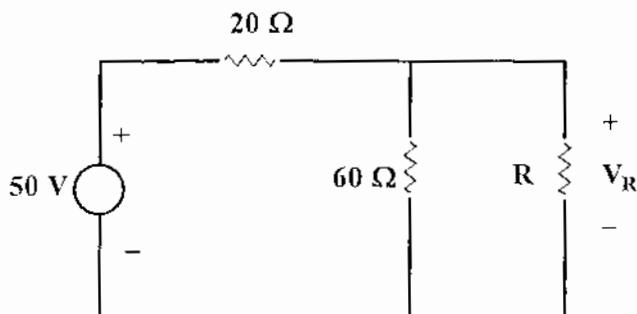
Use engineering paper. Work only on one side of the paper. Use this sheet as your cover sheet, placed on top of your work and stapled in the top left-hand corner. Number the problems at the top of the page, in the center of the sheet. **Do neat work. Underline your answers. Show how you got your equations. Be sure to show how you got your answers.** Each problem counts 10 points.

(1) Consider the following:



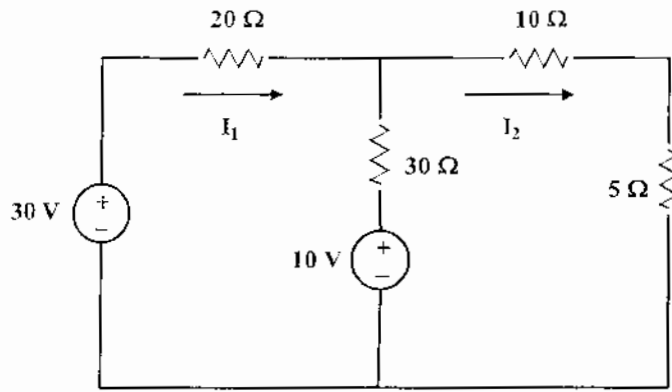
- (a) Find P_{sup} by D. Ans + 40 W
- (b) Find P_{abs} by C. Ans + 24 W
- (c) Find i . Ans +3 A
- (d) Find v . Ans + 7 V

(2) You are given the following circuit.



- (a) Find the value of R so that $V_R = 30$ V. Ans: $R = 60 \Omega$
- (b) Find the power absorbed by the 60Ω resistor. Ans 15 W
- (c) Find the power absorbed by the 20Ω resistor. Ans 20 W
- (d) Find the power absorbed by the resistor, R . Ans 15 W
- (e) Find the power supplied by the 50 source. Ans 50 W

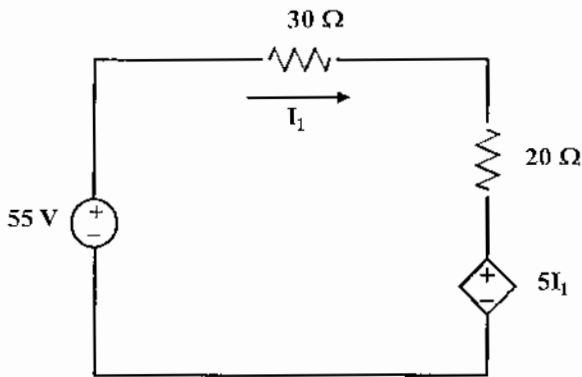
(3) You are given the following circuit.



0.489A 0.815A

Use branch current methods to find the currents I_1 and I_2 . Ans $I_1 = 0.417$ A, $I_2 = 0.278$ A

(4) You are given the circuit shown below.



Find the current I_1 . Ans $I_1 = 1$ A

5. Text Problem 2.12:

- (a) P_A supplies 75 W, P_B supplies 25 W, P_C absorbs 50 W, P_D absorbs 40 W, P_F absorbs 10 W
 (b) Total power supplied: $P_T = 100$ W

6. Text Problem 2.33:

- (a) $I_o = -2$ A, $I_1 = -2$ A, $I_3 = 6$ A, $I_5 = 10$ A; (b) $R_o = 1$ ohm.

7. Text Problem 2.38:

$R_{eq} = 11.4$ ohms

8. Text Problem 2.40:

$R = 10$ ohms

9. Text Problem 2.49:

$V_{AB} = 4.58$ V

10. Text Problem 2.61:

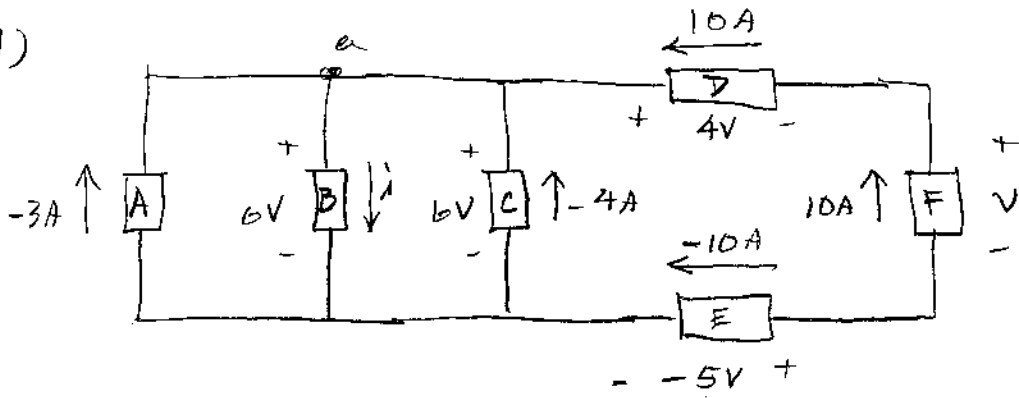
$r_m = 1.55$ M Ω

Other suggested Problems: 2.9, 2.20, 2.43, 2.48, 2.56

wkg

HW #1

(1)



(a) $P_{SUPD} = 4 \times 10 = \underline{40W}$

(b) $P_{AbsC} = - (6)(-4) = \underline{24W}$

(c) Σ current leaving "a"

$$i - (-3) - (-4A) - 10 = 0$$

$$i + 3 + 4 - 10 = 0$$

$$\boxed{i = 3A}$$

(d) Σ loops = 0, ccw

$$-V - 4 + 6 - (-5) = 0$$

$$\boxed{V = 7V}$$

w/20

(2) CONTINUED

(c) P_{20} :

$$V_{20} = 50 - 30 = 20 \text{ V}$$

$$P_{20} = \frac{V_{20}^2}{20} = \frac{20^2}{20} = 20 \text{ W}$$

$$P_{20} = 20 \text{ W}$$

(d)

$$P_R = P_{60} = 15 \text{ W}$$

$$P_R = 15 \text{ W}$$

(e)

P_{sup}

$$I = \frac{50}{20 + 60 \parallel 60} = \frac{50}{20 + 30}$$

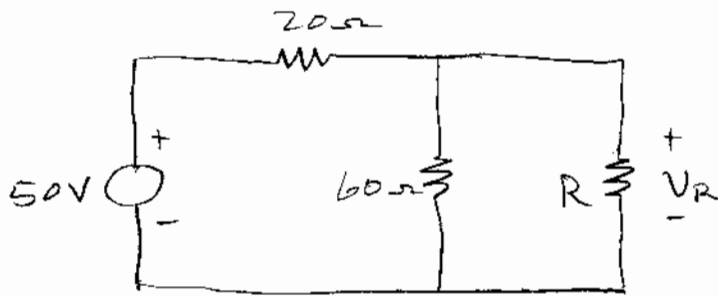
$$I = 1 \text{ A}$$

$$P_{\text{sup}} = 50 \times 1 = 50 \text{ W}$$

$$P_{\text{sup}} = 50 \text{ W}$$

222

(2)



(a) Find R so that $V_R = 30V$.

$$R_{eq} = \frac{60 \times R}{60 + R}$$

$$V_R = 30 = \frac{50 \times \left(\frac{60 \times R}{60 + R} \right)}{20 + \frac{60 \times R}{60 + R}}$$

$$30 = \frac{3000R}{20(60 + R) + 60R}$$

$$30 = \frac{3000R}{1200 + 80R}$$

$$2400R + 36,000 = 3000R$$

$$600R = 36,000$$

$$R = 60 \Omega$$

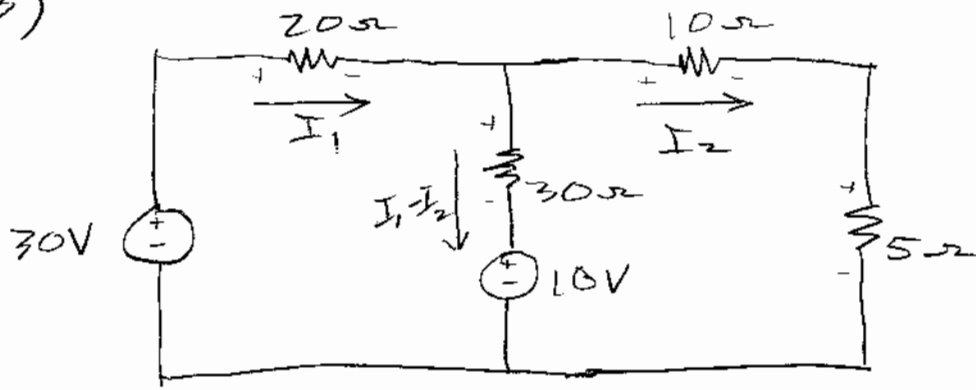
(b)

$$P_{60} = \frac{V_R^2}{60} = \frac{30^2}{60} = 15W$$

$$P_{60} = 60W$$

W89

(3)



$$-30 + 20I_1 + 30(I_1 - I_2) + 10 = 0$$

$$50I_1 - 30I_2 = 20$$

$$-10 - 30(I_1 - I_2) + 10I_2 + 5I_2 = 0$$

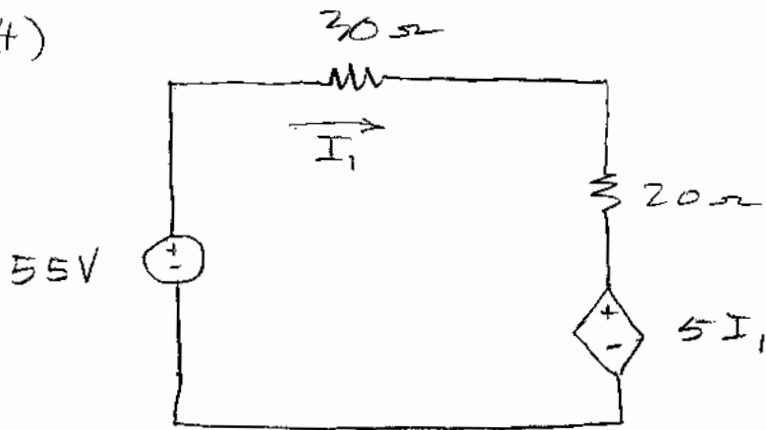
$$-30I_1 + 45I_2 = 10$$

$$\begin{bmatrix} 50 & -30 \\ -30 & 45 \end{bmatrix} \begin{bmatrix} I_1 \\ I_2 \end{bmatrix} = \begin{bmatrix} 20 \\ 10 \end{bmatrix}$$

$$I_1 = 0.889 \text{ A}$$

$$I_2 = 0.815 \text{ A}$$

(4)



Find I_1 :

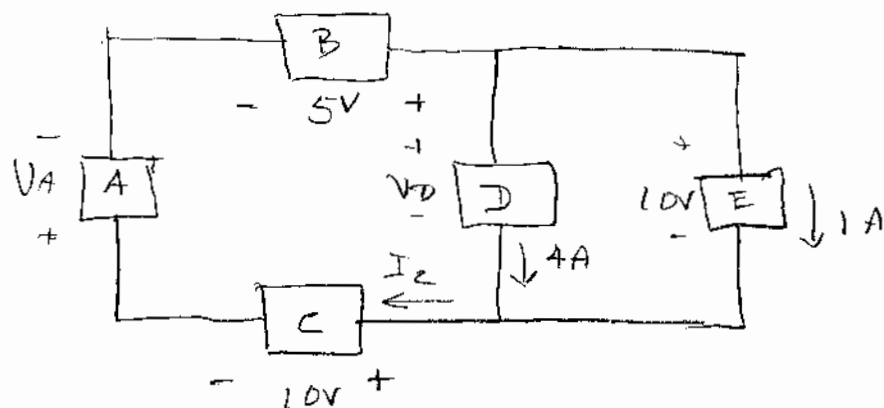
$$-55 + 20I_1 + 20I_1 + 5I_1 = 0$$

$$55I_1 = 55$$

$$I_1 = 1 \text{ A}$$

5

Problem 2.12



$$I_c = 4 + 1 = 5A$$

$$P_c \text{ (supplied)} = 5 \times 10 = 50W$$

$$10 + V_A - 5 + 10 = 0$$

$$V_A = -15V$$

$$P_A \text{ supplied} = -(5(-15)) = +75W$$

$$P_B \text{ supplied} = 5 \times 5 = 25W$$

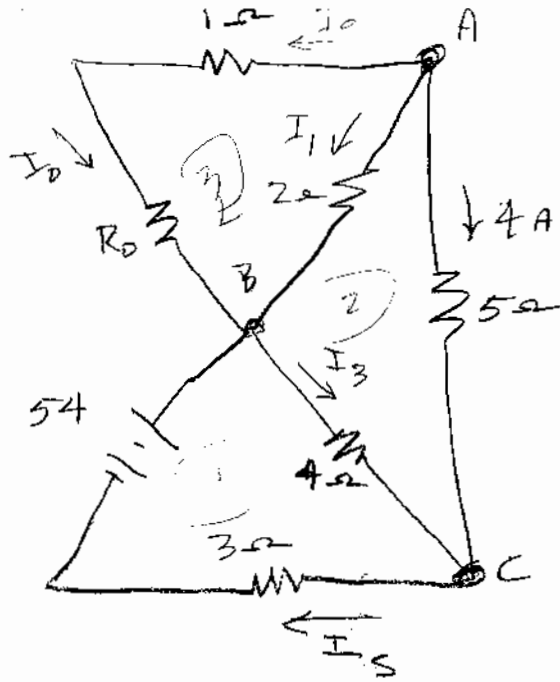
$$P_D \text{ supplied} = -4 \times 10 = -40W$$

$$P_E \text{ supplied} = -1 \times 10 = -10W$$

(b) Power supplied = $75 + 25 = 100W$

Power absorbed = $50 + 40 + 10 = 100W$

2.33



Three nodes, only two can be independent.
Use (A) and (C) nodes.

$$\text{At (A)} \quad I_0 + I_1 + 4 = 0 \quad (1)$$

$$\text{At (C)} \quad I_3 + 4 = I_5 \quad (2)$$

Applying KVL (1)

$$-54 + 4I_3 + 3I_5 = 0 \quad (3)$$

Applying KVL (2)

$$-2I_1 + 20 - 4I_3 = 0 \quad (4)$$

2.33

Put (1), (2), (3), (4) in proper order

$$\boxed{I_0 + I_1 + 0I_3 + 0I_5 = -4} \quad (1A)$$

$$\boxed{0I_0 + 0I_1 + I_3 - I_5 = -4} \quad (2A)$$

$$\boxed{0I_0 + 0I_1 + 4I_3 + 3I_5 = +54} \quad (3A)$$

$$\boxed{0I_0 + 2I_1 + 4I_3 + 0I_5 = +20} \quad (4A)$$

$$\begin{bmatrix} 1 & 1 & 0 & 0 \\ 0 & 0 & 1 & -1 \\ 0 & 0 & 4 & 3 \\ 0 & 2 & 4 & 0 \end{bmatrix} \begin{bmatrix} I_0 \\ I_1 \\ I_3 \\ I_5 \end{bmatrix} = \begin{bmatrix} -4 \\ -4 \\ 54 \\ 20 \end{bmatrix}$$

$$\boxed{I_0 = -2A}, \quad \boxed{I_1 = -2A}, \quad \boxed{I_3 = 6A}, \quad \boxed{I_5 = 10A}$$

~~///~~

AROUND (3)

$$-R_0 I_0 - I_0 + 2I_1 = 0$$

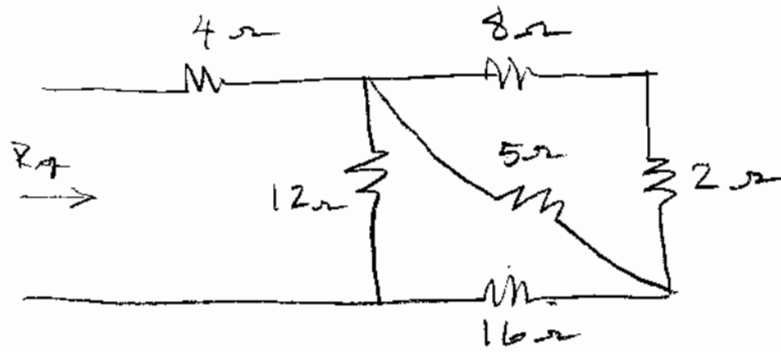
$$\text{OR } 2R_0 + 2 - 4 = 0$$

$$2R_0 = 2$$

$$\boxed{R_0 = 1\Omega}$$

① Problem 2,38

Given



Find R_q

$$10 \parallel 5 = \frac{5 \times 10}{15} = \frac{50}{15} = \frac{10}{3}\ \Omega$$

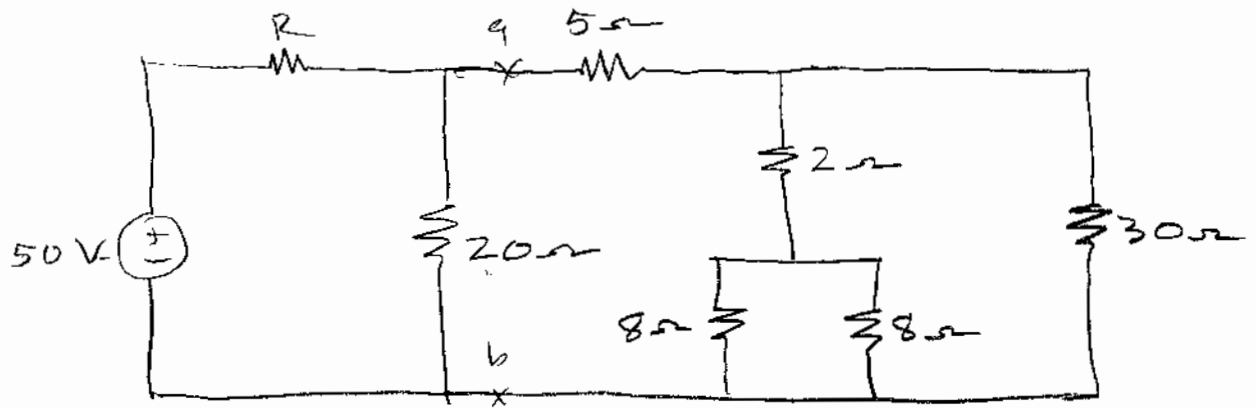
$$\frac{10}{3} + 16 = \frac{10 + 48}{3} = \frac{58}{3}$$

$$\frac{\left(\frac{58}{3}\right)(12)}{\frac{58}{3} + 12} = \frac{58 \times 12}{58 + 36} = 7.404\ \Omega$$

$$R_q = 4 + 7.404$$

$$R_q = 11.4\ \Omega$$

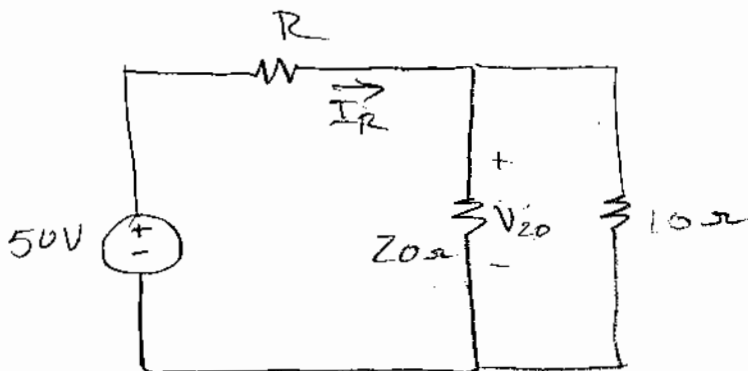
② Prob 2.40



$P_{AB, 20} = 20W$. Find R

$$R_{ab} = 5 + 30 \parallel 6 = 5 + \frac{30 \times 6}{36}$$

$$R_{ab} = 5 + 5 = 10\Omega$$



$$\frac{V_{20}}{20} = 20 \Rightarrow V_{20}^2 = 400 \Rightarrow V_{20} = 20V$$

$$I_{20} = \frac{20}{20} = 1A$$

$$I_{10} = \frac{20}{10} = 2A$$

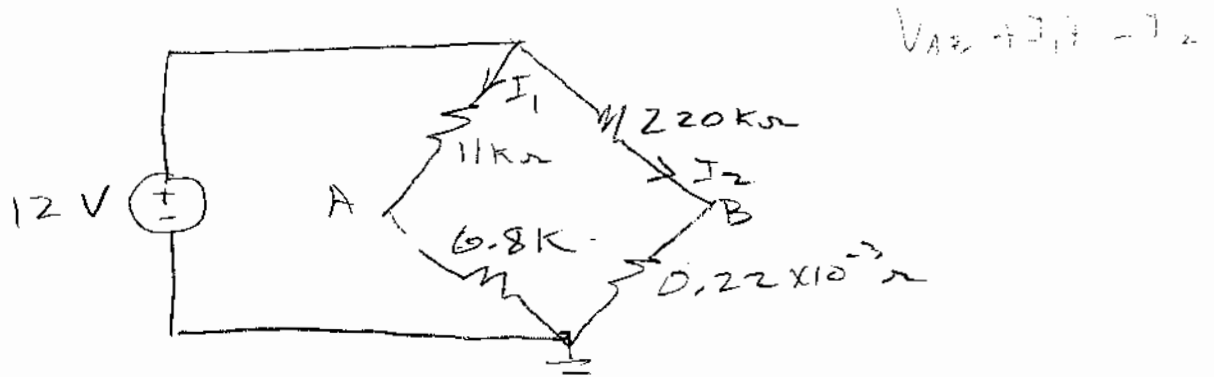
$$I_R = 3A$$

$$V_R = 30V$$

$$R = \frac{30}{3} = 10\Omega$$

(9) Prob 2.49

Determine the voltage between nodes A and B in the following ckt,



$$I_1 = \frac{12}{17.8k} = \frac{12 \times 10^{-3}}{17.8}$$

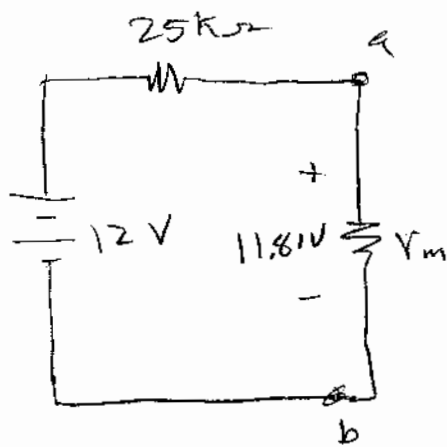
$$I_2 = \frac{12}{220k} = \frac{12 \times 10^{-3}}{220}$$

$$V_{AB} = (220 \times 10^3) \left(\frac{12 \times 10^{-3}}{220} \right) - \frac{12 \times 11 \times 10^3}{17.8}$$

$$V_{AB} = 12 - 7.416$$

$$V_{AB} = 4.58 \text{ V}$$

10



$$\frac{12 \times V_m}{V_m + 25K} = 11.81$$

$$12 V_m = 11.81 V_m + 25 \times 11.81 \times 10^3$$

$$0.19 V_m = 25 \times 11.81 \times 10^3$$

$$V_m = 1.55 M\Omega$$

A perfect meter would read 12V

This meter with $V_m = 1.55 M\Omega$ reads 11.81V