

Department of Electrical Engineering
Sessional Assignment
Course Details

Course Title: Instrumentation and Measurement

Module: 6th (BE)

Student Details

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Q1: A wattmeter has 2 current coils connected in parallel, each having a resistance of 0.7Ω . The wattmeter is connected in a circuit to measure power with its potential coil on the supply side. The reading on the wattmeter is 100W and the reading on the ammeter connected in series with the current coil is 3A. Calculate:

- a) Power loss in the wattmeter
- b) True load power
- c) Percentage error due to wattmeter connection

Q2: Two voltmeters have the same range 0-500V. The internal resistances are $30K\Omega$ and $20K\Omega$ respectively. If they are connected in series and 700V be applied across them, what will be their readings?

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Question 1:-

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Given data

$$\begin{aligned} 2 \text{ Current coil of wattmeter} &= R_1 = 0.7 \Omega \\ &= R_2 = 0.7 \Omega \end{aligned}$$

$$\text{Power} = 100 \text{ W}$$

$$\text{Current} = I = 3 \text{ A}$$

Required

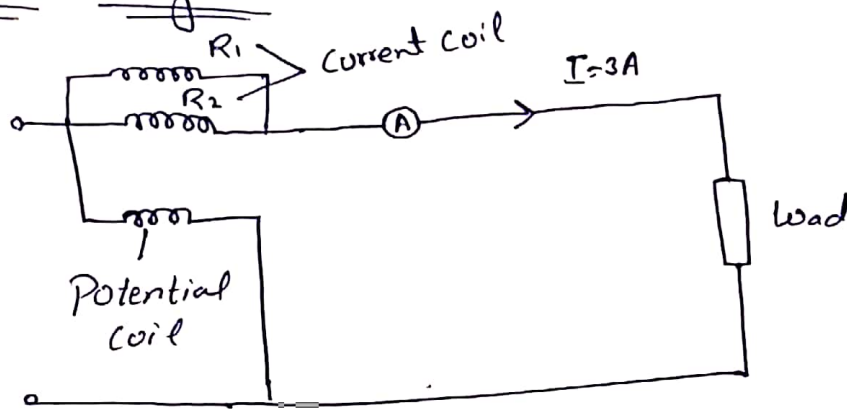
- 1) Power loss in the wattmeter
- 2) True load power
- 3) Percentage error due to wattmeter connection.

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(2)

Circuit diagram:-



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Effective resistance of the current

$$R_c = \frac{R_1 R_2}{R_1 + R_2} = \frac{0.7 \times 0.7}{0.7 + 0.7} = 0.35 \Omega.$$

1) Power loss in the wattmeter = $I^2 R_c$
 $= (3)^2 (0.35) = (9)(0.35) = 3.15 \text{ W}$

2) True load power = $100 - 3.15 = 96.85 \text{ W}$.

3) % age error = $\frac{100 - 96.85}{96.85} = \frac{3.15}{96.85} \times 100 = 3.25\%$
 $\times 100$

Question No 2:

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(3)

Given data

Voltage range = $V = 0 - 500V$

$R_1 = 30k\Omega$

$R_2 = 20k\Omega$

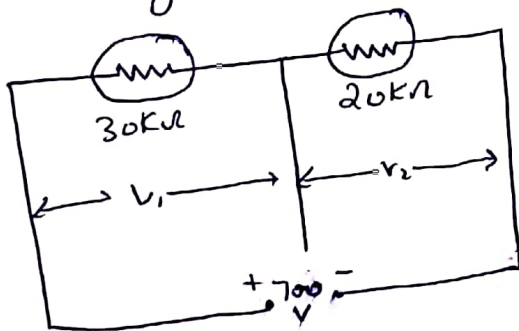
$V_T = 700V$

Required

$V_1 = ?$

$V_2 = ?$

Circuit diagram:-



Sol

Voltage divider rule the voltage of two voltmeter are

$$V_1 = \frac{30k\Omega}{30k\Omega + 20k\Omega} \times 700$$

$$V_1 = \frac{30k\Omega}{50k\Omega} \times 700 \Rightarrow 0.6 \times 700 = 420V$$

$$V_2 = \frac{20\text{K}\Omega}{30\text{K}\Omega + 20\text{K}\Omega} \times 700$$

$$= \frac{20\text{K}\Omega}{50\text{K}\Omega} \times 700$$

$$= 0.4 \times 700$$

$$= 280\text{V}$$