

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 $0\text{-}500\text{V}$. The internal resistances are $30\text{K}\Omega$ and $20\text{K}\Omega$ respectively. If they are connected in series and 700V be applied across them, what will be their readings?

Q:1 A wattmeter has two 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 $100W$ & 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:-

Ans:

Given data:

$$R_1 = 0.7\Omega$$

$$R_2 = 0.7\Omega$$

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

$$I = 3A$$

Required:

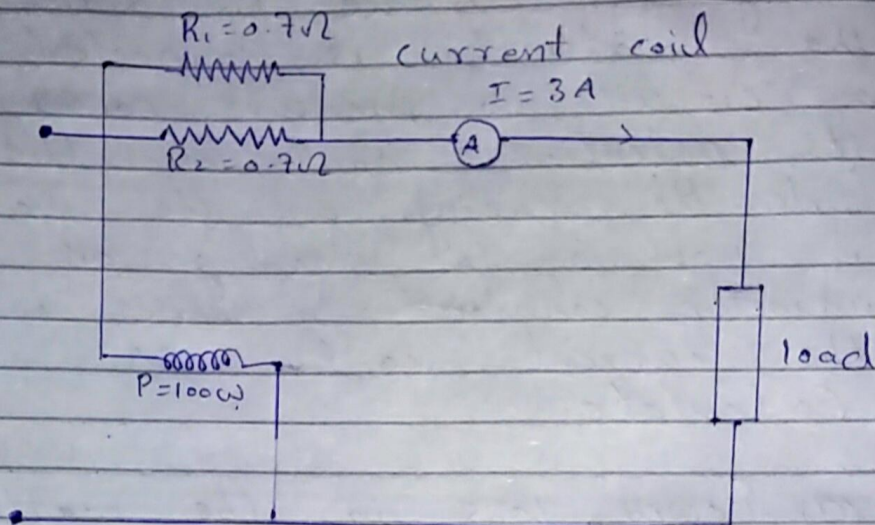
- (a) Power loss in the wattmeter?
 (b) True load Power = ?
 (c) Percentage error due to wattmeter connection = ?

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Diagram:



Solution:

Resistance of current coils

$$R_c = \frac{R_1 R_2}{R_1 + R_2} = \frac{0.7 \times 0.7}{0.7 + 0.7} = \frac{0.49}{1.4} = 0.35\Omega$$

(a) Power loss in wattmeter = $I^2 R_c$

$$I^2 R_c = (3^2 \times 0.35) \\ = 9 \times 0.35 = 3.15W$$

(b) True load Power = $100 - 3.15$
 $= 96.85W$

(c) Percentage error = $\frac{P - \text{True load}}{\text{True load}} \times 100$

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$$= \frac{100 - 96.85}{96.85} \times 100$$

$$\% \text{ error} = 3.252$$

Q: 2

Ans: Given data:

Two voltmeters range $0-500\text{V}$

$$R_1 = 30\text{K}\Omega$$

$$R_2 = 20\text{K}\Omega$$

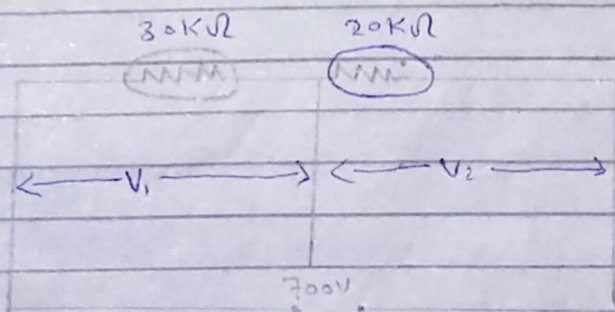
$$\text{Total voltage} = V_T = 700\text{V}$$

Required:

Voltage reading in 1st
voltmeter $= V_1$?

Voltage reading in 2nd voltmeter
 $V_2 = ?$

Diagram:



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Solution:

Here by voltage divider rule the reading of the two voltmeter are.

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

$$V_1 = 420\text{V}$$

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

$$V_2 = 280\text{V}$$