Department of Electrical Engineering

Assignment

Date: 23/06/2020

Course Details

Course Title: Instrumentation and Measurement **Module:** 6th [BE]

Instructor: **Total Marks:** 50

Student Details

Name: mohsin ali **Student ID:** 13746

Note: Draw neat diagrams where necessary. Assume missing details if required.

Q1.	A student has connected two voltmeters in series and have applied 500V across them. Both voltmeters have the same range of 0-300V. What will be their readings if their internal resistances are 25kΩ and 15 kΩ respectively?	Marks 10 CLO 2
Q2.	A dynamometer type wattmeter has two current coils each having a resistance of 0.5Ω. Both of the coils are connected in parallel. The wattmeter voltage coil is connected to the supply side. The wattmeter shows a reading of 200W while the reading on the ammeter is 4A which is connected in series with the current coil of the wattmeter. Calculate the following parameters: a) Power dissipated in the wattmeter b) True load power c) Percentage error due to the connection of wattmeter	Marks 10 CLO 2
Q3. (a)	What is the difference between Kelvin's bridge and Wheatstone Bridge? Explain briefly.	Marks 05 CLO 3
(b)	Explain how the potential on the upper (top) node in a DC bridge is equal to the potential on the lower (bottom) node?	Marks 05 CLO 3
Q4. (a)	Why the energy meters designed for DC circuits cannot be used for AC circuits?	Marks 05 CLO 03
(b)	What will happen if the phase difference between two alternating fluxes in an induction type energy meter is zero degrees?	Marks 05 CLO 03
Q5. (c)	Why the series magnet is wound with a wire of few turns as compared to shunt magnet in an induction type energy meter?	Marks 05 CLO 03
(d)	What is the significance of meter constant in an energy meter?	Marks 05

Name: Monsin Ali ID: 13746 EMI Paper

Teacher: Sir waleed Jan

Given Data:

Two Voltmeter range = 0 - 300V

$R_1 = 25 k\Omega$

$R_2 = 15 k\Omega$

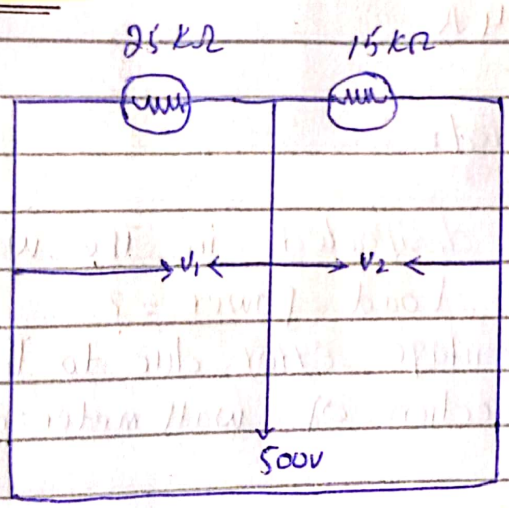
Total voltage $V_I = 500V$

Required:

Voltage reading in 1st voltmeter = V_1 ?

Voltage reading in 2nd voltmeter = V_2 ?

Diagram:



Solution

Here we use voltage divider rule The reading of the Two voltmeter are.

$$V_1 = \frac{25k\Omega}{25k\Omega + 15k\Omega} \times 500$$

$$V_1 = 312.5V$$

P.T.O

$$V_2 = \frac{15K\Omega}{25K\Omega + 15K\Omega} \times 500V$$

$$\boxed{V_2 = 187.5V}$$

Q2

Given data:

$R_1 = 0.5\Omega$

$R_2 = 0.5\Omega$

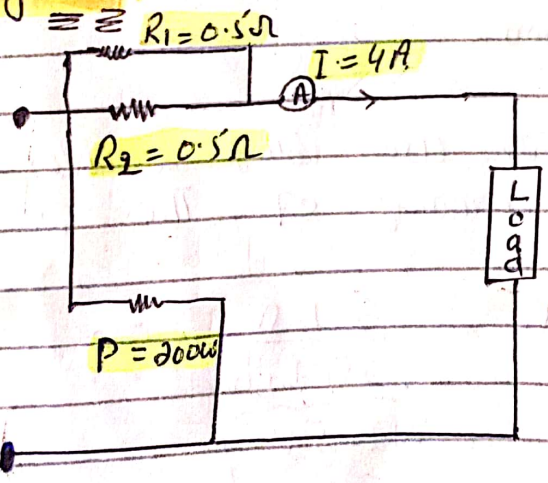
Power $P = 200W$

$I = 4A$

Required:

1) Power dissipated in the wattmeter = ?
2) True Load power = ?
3) percentage error due to the Connection of watt meter = ?

Diagram:



P.T.O

Sollution:-

Resistance of current coils

$$R_c = \frac{R_1 R_2}{R_1 + R_2}$$

$$R_c = \frac{0.5 \times 0.5}{0.5 + 0.5}$$

$$R_c = \frac{0.25}{1} = 0.25\,\Omega$$

(a) Power dissipeate in wathmeter.—

$$P = I^2 R_c$$

$$= ((4)^2 \times 0.25)$$

$$= 16 \times 0.25$$

$$P = 4w$$

P = 4w

(b) True load power = 200 − 4

= 196 w

(c)

$$\% \text{ error} = \frac{P - \text{True load}}{\text{True load Power}} \times 100$$

$$= \frac{200 - 196}{196} \times 100 = 2.0408$$

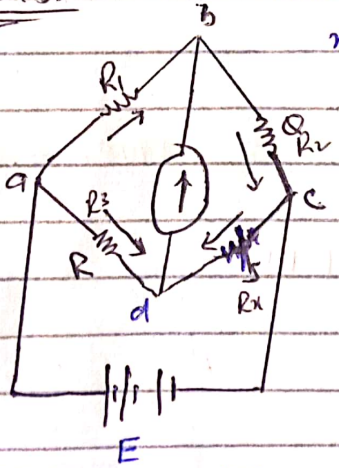
% error = 2.0408

Q 3 @ What is The difference b/w Kelvin's bridge and Wheat stone Bridge? explain breifly.

ANS. A Wheat stone bridge measures electrical resistance by balancing a bridge ckt. The circut has two legs, of which one cantain The unknown resistance of value between 1 ohm to 10 ohms A part from resistance, This setup can also measure Impedence, Cappacitance and Inductance. The W.s bridge is The Combination of 4 resistance forming a bridge.

The kelvin bridge is more advance and helps in measuring resistance Less Than I ohm, however, it has Two more resistors than The wheatstone bridge. The kelvin bridge use for Measuring unknown resistance having value Less Than 1 Ω it is modified form of

Digrams:



Wheat stone bridge

P. T. O

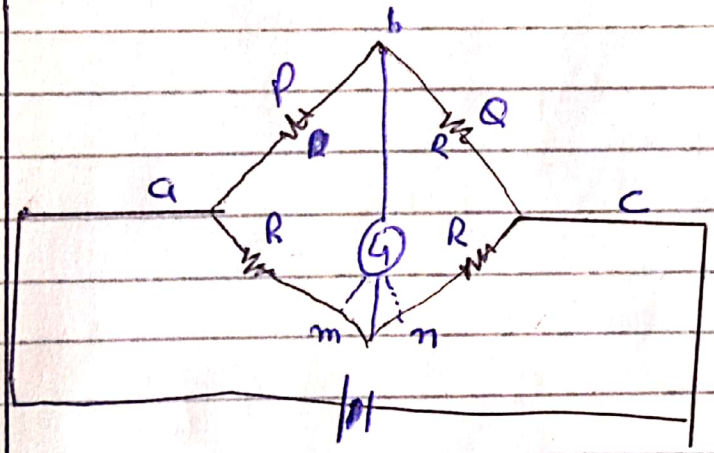
In kelven's bridge This bridge is modification of wheal stone bridge and is used to measur low resistance very accuratOy

→ When we are Implementing Wheatstone bridge in The Laboratory, we connect all The resistance Through Connecting wires.

→ Hence These connecting wires also have Same resistance and in order to measure it we will use kelvin's bridge

fram w.s bridge we know That

$$R = \frac{P}{Q} * S \rightarrow (1)$$



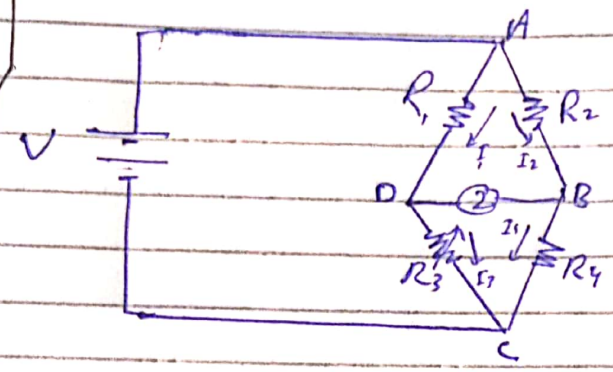
kelven's bridge

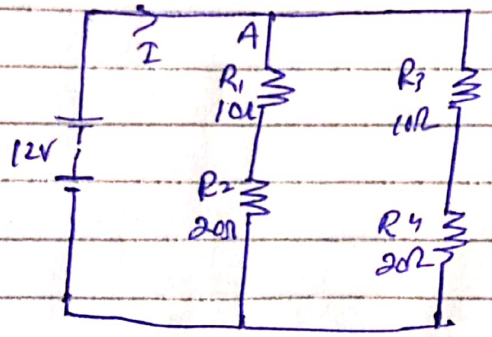
Q3 (b)

ANS:

Bridge circul are particularly useful in connecting resistance Changes in to voltage bridge that can be in put directly into automatic control System.

The difference in potintial crucial current flows not the value of the Potintial to ground of end points.





$$I_1 = \frac{V}{R} = \frac{12}{20+10} = \frac{12}{30} = 0.4\ A$$

$$VR_2 = I \times R_2 = 0.4 \times 20 = 8\ Volt = 8V$$

P.to

$I_T R_1 = 0.4 \times 10 = 4V$

$VR_1 = 4V$ and $VR_2 = 8V$

Both point have same value of 8 volt and C = D = 8 volts

the difference is 0 volts.

When this happens both side of the parallel network are said to be balanced because the voltage at point "C" is the same value as the voltage at point "D"

Q4 (a)

(a) Why the energy meter design for DC circuit cannot be used for AC circuit?

Ans:

Energy meter designed for DC circut not AC Because AC energy work due to involment of two alternating magnatic fields produced by Ac Quantities (voltage and current) That interacts with an aluminium disk causing eddy current to induced in the disk. In DC such induction effect and eddy current nor produced.

Q4 (b) What will be happen if the phase difference b/w two alternating fluxes in an induction type energy meter is zero.

Ans

it should be noted that when $\phi = 0$ (i.e Two flumes are in phase) Then deflecting Torque is zero or no Torque can be produced.

Torque will be minimum when $\theta = 90^\circ$

Q5

(a) Why The Seriel magnatic is Wound with a wire of few turn as compare to shunt magnetic in an Induction type energy meter.

ANS: The Series magnatic is Wound with a wire of few turn ans Connected in Series with load it carries the load current The coil of This magnitic is highly non inductive.

(b) what is The significence of meter Constant in an energy meter.

ANS:

$N \propto$ energy

$N = K$ energy

K is Constant called meter Constant

$$K = \frac{N}{\text{energy}} = \frac{\text{number of revalation}}{\text{kWh}}$$

Hence The number of revalutions made by The disk for 1 kWH of energy Consumption is called meter Constant

for example: if meter Constant of energy meter is 1500 rev/Kwh

(Q) (10

it means that for consumption of 1kwh the disk will make 1500 revolution.

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