Department of Electrical Engineering

Subject: EMI

Spring: 2019-20

Date: 23/06/2020

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Q 1:

A student has connected two voltmeters in series and have applied 500 V across them. Both voltmeters have the same range of 0-300 V. What will be their readings if their internal resistance are 25 KΩ and 15 ΩK respectively?

Solution:

Given data

$V = 500\,V$

$R_1 = 25\,K\Omega$

$R_2 = 15\,K\Omega$

$Rang = 0 - 300\,V$

Required data

$V_1 = ?$

$V_2 = ?$

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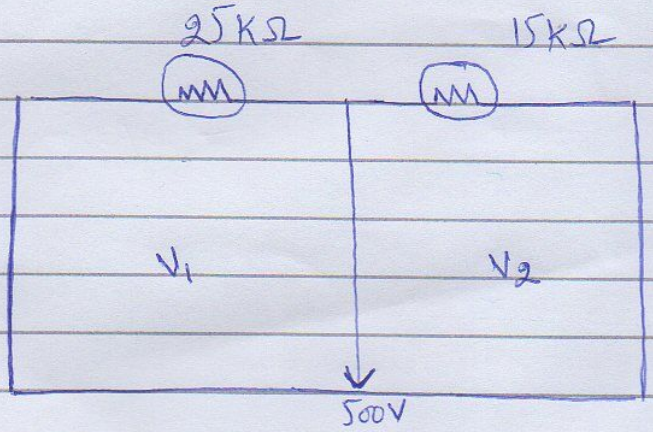


Solution:

As we know that

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

$$V_1 = 312.5V$$

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

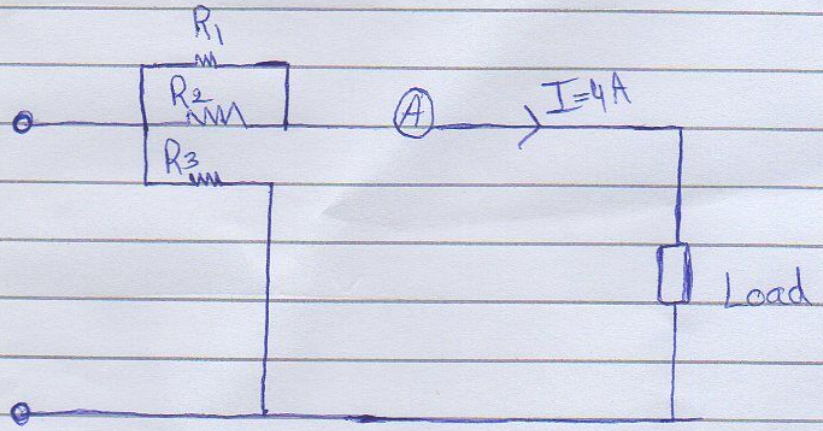
$$V_2 = 187.5V$$

Q 2:

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 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 connection of wattmeter.

Solution: As we know that



Solution:

Effective resistance of the current coil.

$$R_c = \frac{R_1 R_2}{R_1 + R_2} = \frac{0.5 \times 0.5}{0.5 + 0.5}$$

$$R_c = 0.25\ A$$

Power dissipated in the

Wattmeter $= I^2 R_c$

$$I^2 R_c = (4)^2 (0.25)$$

$$\Rightarrow 4 \text{ Watt}$$

True Load power:

$\Rightarrow 200 - 4$

$\Rightarrow 196\ W$

Percentage error:

$\Rightarrow \frac{200 - 196}{196} \times 100$

$\Rightarrow 2.04\%$

Q3 Part A:

What is the difference b/w Kelvin's bridge and wheatstone Bridge? Explain briefly.

Answer:

A wheatstone bridge measure electrical resistance by balancing a bridge circuit. The circuit has two legs of which one contains the unknown resistance of value b/w 1 Ω to 10 Ω. The Kelvin bridge is more advanced and help in measuring resistance less than 1 Ω

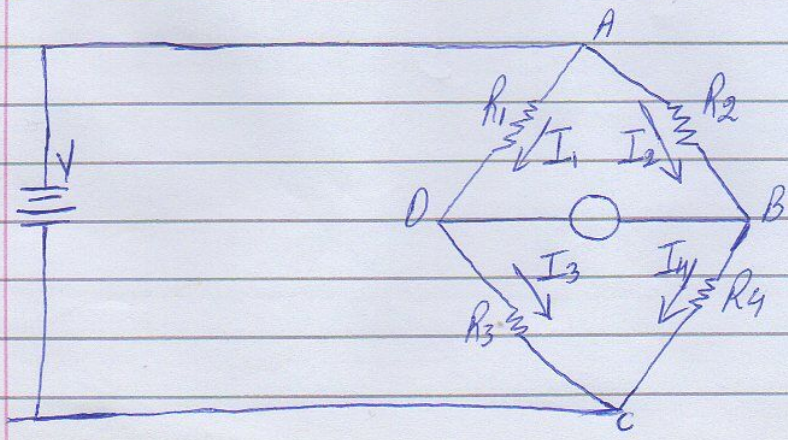
Q3 Part B:

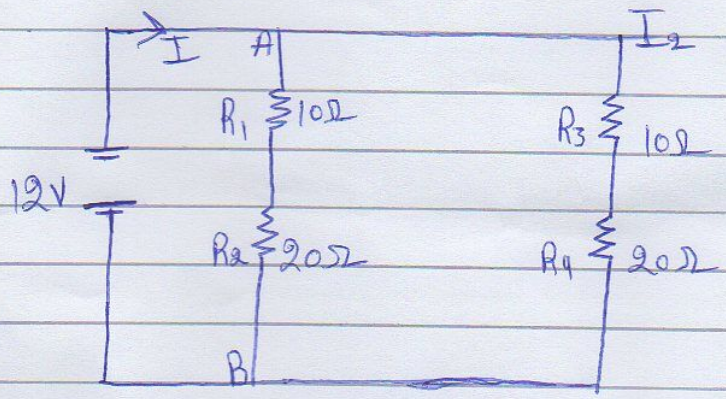
Explain how the potential on the upper (top) node in a DC bridge is equal to the potential on the lower (bottom) node?

Answer:

Voltage potential and current movement:

The difference in paralled is circuit for current flow not the value of the potential to ground of the points.





$I_1 = V \div R = 12V \div (10\Omega + 20\Omega) = 0.4A$

$V_{R2} = I \times R_2 = 0.4A \times 20\Omega = 8V$

$V_{R1} = 4V$ and $V_{R2} = 8V$

both point have the same value of 8Volts : C = D = 8Volt when this happens both side of the parallel network are side to be blanced because the voltage at point C is the same value as the voltage at point D.

Q4 part :A:

Why the energy meter designed for Dc circuit cannot be used for Ac circuits?

Answer:

Energy meter designed for Dc circuit not Ac because Ac energy works due to involvement of two alternating magnatic field produced by Ac quantities that interacts with an aluminium disk causing eddy current to induced effect and eddy current nor produced.

Q4 part :B:

What will happen if the phase difference b/w two alternating fluxes in an induction types energy metex is zero degrees?

Answer:

It should be noted that when $\theta = 0^\circ$ (i.e two fluxes are in phase) than deflecting torque is zero or no torque can be produced. Torque will be maximum when $\theta = 90^\circ$.

Q5 Part (C)

Why the series magnet is wound with a wire of few turn as compared to shunt magnet in an induction types energy meter?

Answer:

The series magnetic is wound with a wire of few turns asir connectected in series with load so that it carries the load current The coil of this magnatic is highly non-inductive

Q5 Part :D:

What is the significance of meter constant in an energy meter?

Aswer:

The constant is shown on the meter nameplate. A constant Kh = 7.2 means that for each revolution of the disk 7.2 watt-hours has been used consant will vary will different meters. To determine how much electrical energy is used by counting meter disk revolutions. proceed as follow.

Energy meter constant is the amount of kwh.

used in its low voltage circuit for each revolution of the induction disc. typical industrial 3 phase Energy meter which is fed by a suitable current transformer [CT] and potential transformer.

To calculate the EMC. If it is given that No of Revolutions.

Example: If meter constant of energy meter is 1500 kwh. It mean that for consumption is 1 Kwh the disc will make 1500 revolution.