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: **Student ID:**

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** **CLO 03**

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Date : 23-06-2020

Subject: EMI

Submitted to :

Sir Walled Jan

(i)

Question. 01

Sol:-

Given data:-

Two voltmeter in series range = 0-300V

Applied voltage across them = 500V

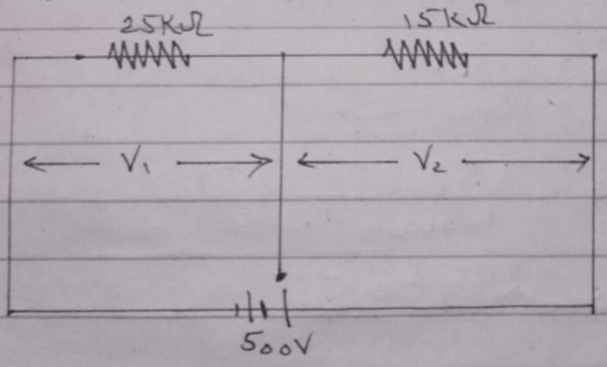
Internal resistance of V_1 = 25KΩ

Internal resistance of V_2 = 15KΩ

Required:-

we have to find readings in both voltmeters.

Diagram:-



Formula:-

$$V_1 = \frac{R_1}{R_1+R_2} \times V$$

Solution:-

(2)

Solution:-

$$V_1 = \frac{R_1}{R_1+R_2} \times V$$

$V_1 \Rightarrow \frac{25\times10^3}{25\times10^3+15\times10^3} \times 500$

$\Rightarrow \frac{25000}{25000+15000} \times 500$

$\Rightarrow \frac{25000}{40000} \times 500$

$\Rightarrow 312.5V$

$V_2 \Rightarrow \frac{R_2}{R_2+R_1} \times V$

$\Rightarrow \frac{15\times10^3}{15\times10^3+25\times10^3} \times 500$

$\Rightarrow \frac{15000}{15000+25000} \times 500$

$\Rightarrow \frac{15000}{40000} \times 500$

$\Rightarrow 0.375 \times 500$

$V_2 \Rightarrow 187.5V$

Question = 2 :-

Given data:-

Coil resistance = R = 0.5Ω

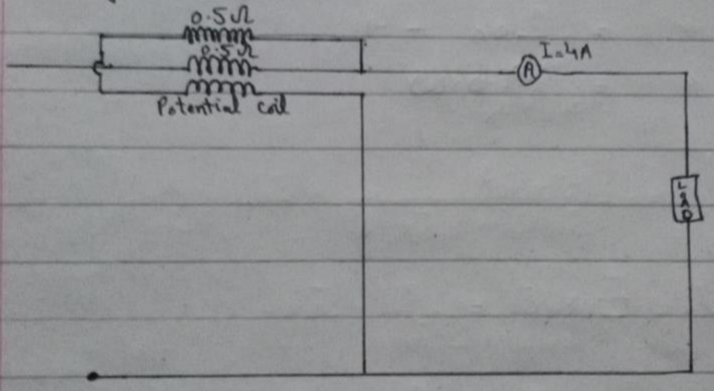
Power = P = 200W

Current = I = 4A

Required:- a):- Dissipated power = ?

b):- True load power = ? ; c):- % error = ?

Diagram:-



Solution:-

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

$$= \frac{(0.5) \times (0.5)}{0.5 + 0.5}$$

$$= \frac{0.25}{1}$$

$$R_c = 0.25\Omega$$

(4):-

a):- Power dissipated in resistance

$P \Rightarrow I^2R$

$\Rightarrow (4)^2(0.25)$

$\Rightarrow 4w$

b):-

True load power=?

T.L.P = Total power - Dissipated power

" = 200 - 4

" = 196 w

c):-

% Error = ?

" " = $\frac{P_T - \text{Load Power}}{\text{Load Power}} \times 100$

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

" " = 2.04 %

-:(5):-

Question . 3 :- (a) :-

i):- Difference between Kelvin Bridge and wheatstone bridge:-

Kelvin Bridge:-

The Kelvin bridge is more advance and helps in measuring resistance less than one ohm. while it has more resistors the W.B.

Wheatstone Bridge:-

It measure electrical resistance by balancing them a bridge circuit. The circuit has two legs in which one contain a resistance between 1 ohm to 10 ohms. It can also measure impedence, Capacitace and inductance.

..(6):-

Question:(3):-(b):-

This part is known as balance condition when $I_3 = 0$ A.

Now as

$V_{BD} = V_B - V_D \Rightarrow I_3 G$

So $V_{BD} = I_3 G$:Now Put I_3 value

$V_{BD} = 0(G) \Rightarrow 0V$ OR

$V_B - V_D = 0$ OR $V_B = V_D$

Now in eq(i) and eq(ii)

i):- $V_{AB} = V_A - V_D = I_1 P \rightarrow$ new equ(i)

$V_{BC} = V_D - V_D = I_1 Q \rightarrow$ new equ(ii)

Now new equ(i) and equ(iii)

$= I_1 P \Rightarrow I_2 R$ (OR) $I_1/I_2 = R/P \rightarrow (5)$

Compare eq(2) with eq(iv)

$I_2 x = I_1 Q$

OR

$I_1/I_2 = x/Q \longrightarrow (6)$

So compare equ(5) and (6)

$R/P = x/Q$

OR

$x = \left(\frac{R}{P}\right) Q$

(7):-

Question. 4 :-(a):-

Energy meter desined for DC circuit is not AC Because AC energy works due to involvement of two alternating megnetic fields produced by AC quantities (voltage and current) that interacts with an aluminium disk causing eddy current to induce in the disk. In DC such induction effect and eddy current not produced.

Part :- (b):-

It should be noted that when $\theta = 0^\circ$ then deflecting torque is zero or no torque can be produced

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

(8):-

Question.(5):-(a)

A series megnetic is wound with a wire & few turns and connected in series with load so that it carries the load current. The coil of this megnetic is highly non-conductive.

Question:-(5):-(b):-

Meter constant:-

$N \propto$ Energy, $N = K \times$ energy

where K is called meter constant

Meter constant:- $K = \frac{N}{\text{energy}} \Rightarrow \frac{\text{no. of revolution}}{\text{Kwh}}$

Hence the nom of revolution made by the disc for 1 Kwh of energy consumption is called meter constant. For example. If meter constant of energy meter is 1500 rev/kwh. It means that for consumption of 1 Kwh the disc will make 1500 revolution.

The End