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(1)

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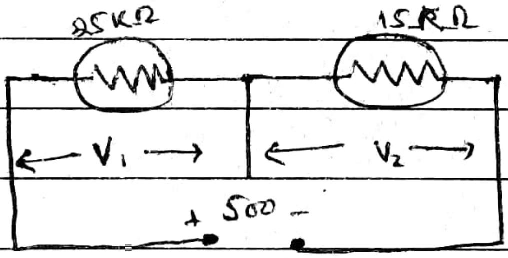
ID :- 6978
Subject :- EMI

Question 1

Sol:- 2 Voltmeter in series = 0 − 300V
Voltage applied across = 500V
Internal Resistance on V_1 = 25KΩ
Internal Resistance on V_2 = 15KΩ



As we know:

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

$$= \frac{25 \times 10^3}{25 \times 10^3 + 15 \times 10^3} \times 500$$

$$= \frac{25,000}{25,000 + 15,000} \times 500$$

Stationery

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$$= \frac{25,000}{40,000} \times 500$$

$V_1 = 312.5$ V

$$V_2 = \frac{R_2}{R_2 + R_1}$$

$$= \frac{15 \times 10^3}{15 \times 10^3 + 25 \times 10^3} \times 500$$

$$= \frac{15,000}{40,000} \times 500$$

$= 0.375 \times 500$

$V_2 = 187.5$ V

x ——— x ——— x

Question 2

Sol:- Given Data:-

Coils connected in parallel having resistance = $R = 0.5$

Power = 200W

Current = $I = 4A$

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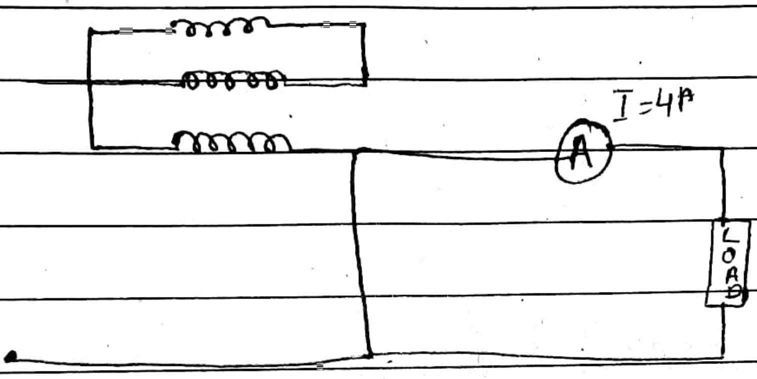
Required Data:-

1) Power dissipated in Wattmeter.

2) True load power

3) % error in it



Sol:-

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

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

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

$$R_c = 0.25\Omega$$

a) $I^2RC = (4)^2(0.25)$

$= 16(0.25)$

$= 4W$

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(2) True load Power

$200 - 4 = 196W$

$= 196W$

(3) Percentage error

$= \frac{200 - 196}{196} \times 10$

$= 2.04\%$

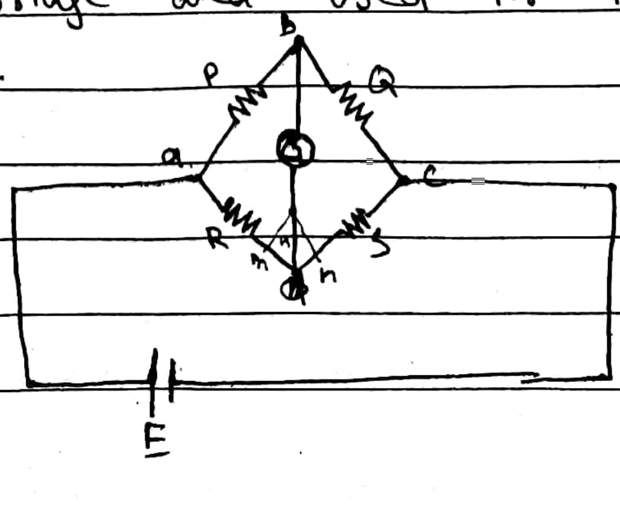
x———x———x

Question 3 (a)

Kelvin Bridge :-

It is more advanced and helps in measuring resistances less than 1 ohm. However it has two more resistors than wheatstone bridge.

A kelvin double Bridge is a variant of wheat stone bridge and used for measuring low resistances.



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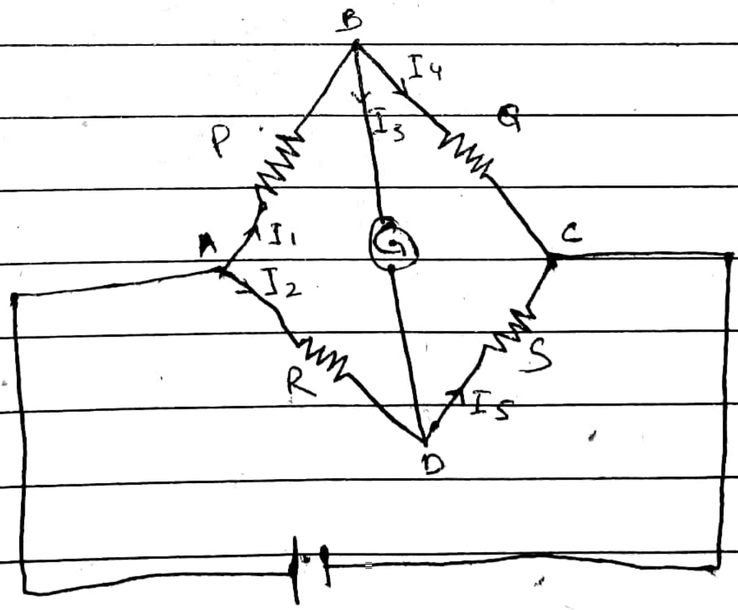
Wheat stone Bridge :-

A wheatstone bridge measure electrical resistance by balancing a bridge circuit. The circuit has two keys, of which one key contains the unknown resistance of value b/w 1 ohm to 10 ohm. Apart from resistance, this setup can also measure impedence, capacitance and inductance.

A wheatstone bridge can be used to measure resistance by comparing an unknown resistor against precison resistor of known value.



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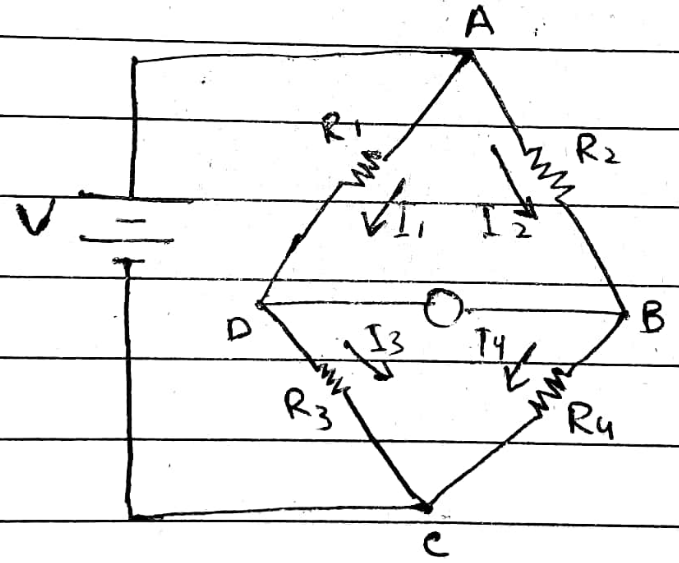
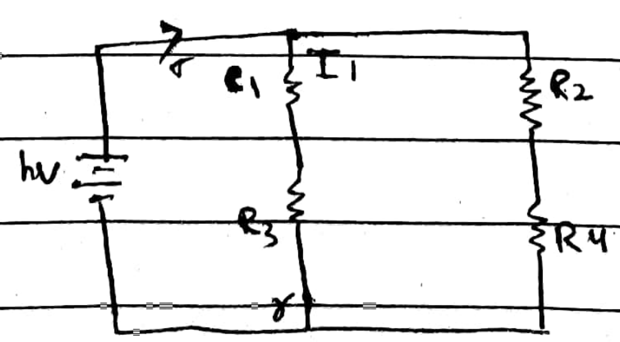
Question 3 (b)

Ans:- Bridge circuits can be particularly useful in connecting resistance changes into voltage bridge that can be input directly into automatic control systems.

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





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$I_1 = V/R = \frac{12}{(10\Omega + 20\Omega)} = 0.4A$

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

$V_{R_1} = 4V$ & $V_{R_2} = 8V$

Both points had the same value of 8Volts The difference is 0 volts, When this happens both sides 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.

x ———— x ———— x

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Question 4 (a)

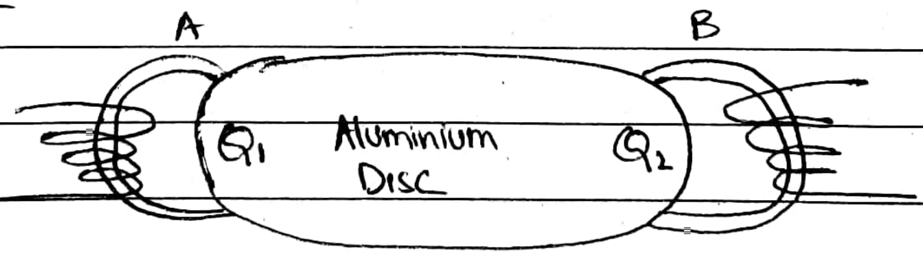
Energy Meter:-

It is an instrument which measures the electrical energy.

Since the electrical energy consumed by a load adds up as the time goes on (watt-hour = watts x hours), it is evident that watt hour meter is an integrity type instrument.

It should be noted that the energy meter designed for DC circuits can be used on AC circuits. but the reverse is not true.

Induction Principle:-



This above fig shows the working principle of induction type energy meters.

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Question 4 (b)

*) When $\theta = 0°$ (i-e the two fluxes are in phase) then deflecting torque is zero.

*) The deflecting torque will be maximum when $\theta = 90$ i-e when the flux has a phase difference of 90°

*) The deflecting torque is the same at every instant since ϕ_m, ϕ, m & θ are fixed for a given condition.

*) The direction of deflecting torque depends upon which flux is leading the othe

x———x———x

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Question 5 (c)

Ans) The shunt magnet is wound with a wire of many turns as it is connected across the supply so that it carries current proportional to the supply voltage. Due to large no of turns, the coil of shunt meter is highly inductive. Hence the current and the flux passing through it lags the supplying voltage by 90°.

The series magnet is wounded with a wire of few turns as is connected in series with the load so that it carries the load current. The coil of this magnet is highly non-inductive.

Question 5 (d)

Ans) Energy meter constant is the amount of KWH used in its low voltage circuit for each revolution of the induction disc. The unit of energy meter constant is revolution per kilo watt. hour.

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It is constant value. If an energy meter value is constant than its equal to 150 rev/KWh. It will consume the energy of 1 KWh (1 unit) in every 150 revolution. If it rotates 300 revs then it will consume 2 KWh energy.

x————x————x