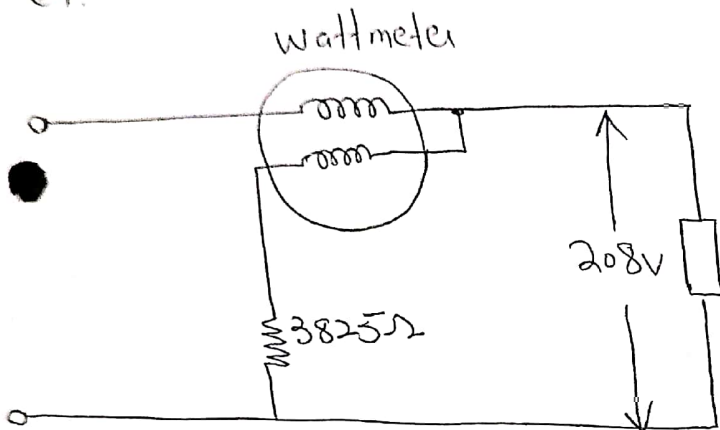


Wattmeter Numericals :-

Q1:- A wattmeter with its voltage coil connected across the load side, reads 192W. The load voltage is 208V and the resistance of the potential coil is 3825Ω . Calculate:-

i:- True load power

ii:- % error due to wattmeter connection



Since the voltage coil of the wattmeter is connected on the load side (given), the power consumed by it is also included in the reading of wattmeter:-

● wattmeter reading = 192W

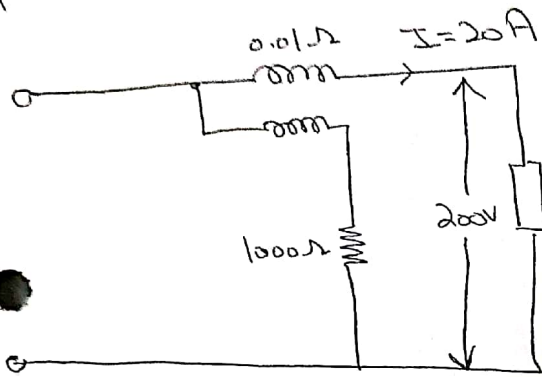
power taken by the potential coil = $\frac{V^2}{R} = \frac{208^2}{3825} = 11.3W$

i:- True load power = $192 - 11.3 = \boxed{180.7W}$

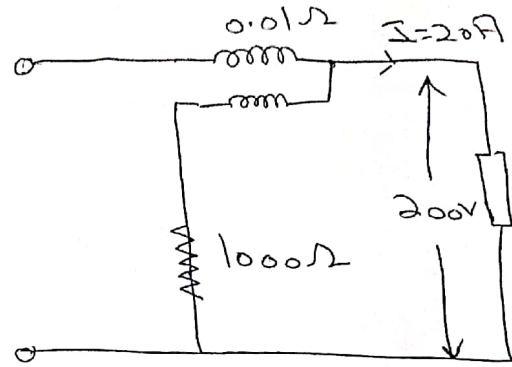
ii:- % error due to wattmeter connection = $\frac{192 - 180.7}{180.7}$

$$\boxed{= 6.25\%}$$

Q2:- The resistances of the two coils of a wattmeter are 0.01Ω and 1000Ω respectively. The load is taking a current of $20A$ at $200V$ and 0.8 pf lagging. Show the two ways in which the voltage coil can be connected and find the error in the reading of the meter in each case.



(i)



(ii)

$$\text{Load power} = VI \cos \phi = (200)(20)(0.8) = 3200W$$

(i):- By considering the connection shown in fig (i):-

$$\text{Power loss in current coil} = I^2 R_c = 20^2 (0.01) = 4W$$

$$\text{Wattmeter reading} = 3200 + 4 = 3204W$$

$$\therefore \text{error} = \frac{3204 - 3200}{3200} \times 100 = \boxed{0.125\%}$$

(ii):- By considering the connection shown in fig (ii),

$$\text{Power loss in voltage coil} = \frac{V^2}{R_p} = \frac{200^2}{1000} = 40W$$

$$\text{Wattmeter reading} = 3200 + 40 = 3240W$$

$$\therefore \text{error} = \frac{3240 - 3200}{3200} \times 100 = \boxed{1.25\%}$$

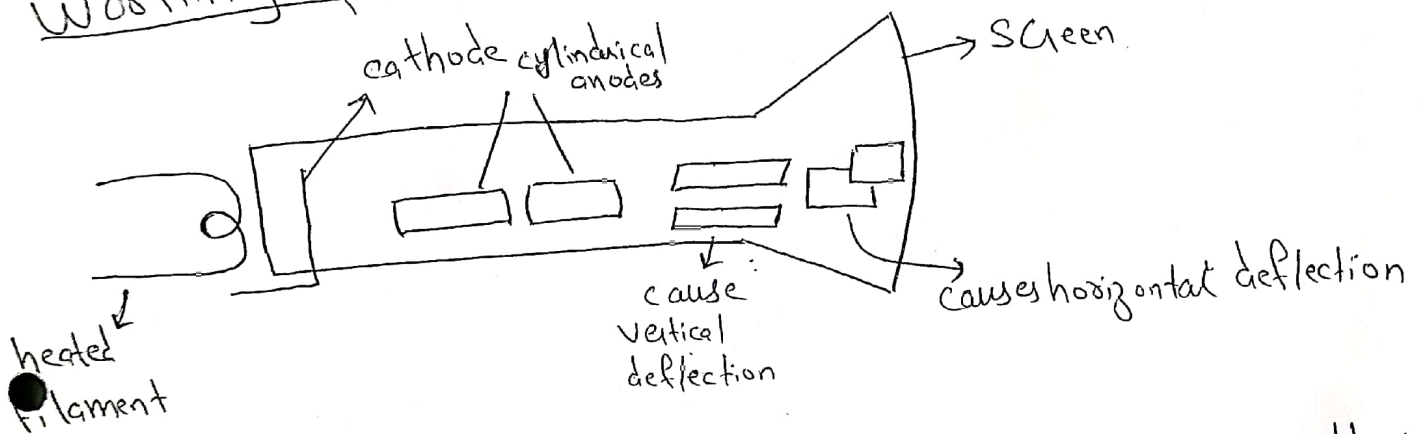
Oscilloscope:-

"An oscilloscope is a laboratory instrument commonly used to display and analyze the waveform of electronic signals as a function of time"

A probe is used to connect the oscilloscope to the circuit. Oscilloscope shows the potential difference between the two terminals of the probe.

- The terminal ending with a hook is usually connected to the node in the ckt whose voltage is of interest.

Working principle of oscilloscope:-

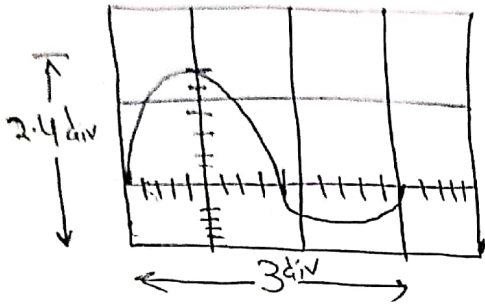


Working:-

- 1:- When we apply a potential to the filament, it heats up thus emitting electrons.
- 2:- These electrons hit the cathode and hence cathode ejects more electrons thus forming an electron beam.
- 3:- Next these electrons are attracted by the cylindrical anodes.
- 4:- Next there are set of plates which gives vertical deflection to the beam and there are other set of plates which gives horizontal deflection to the beam.

Q1: The last part is the screen which is phosphorous coated. The property of phosphor is that when electron beam strikes it, it illuminates.

Numerical 1:-



Q1 Time/Div = 10msec

Suppose volt/Div knob is set at 100mV/Div :-

(a) :- V_{p-p}

(b) :- V_p

(c) :- V_{rms}

(d) :- Time period

(e) :- Frequency

(a) :- $V_{p-p} = \text{no. of vertical divisions} \times \text{Volt/Div}$
 $= 2.4 \times 100 \times 10^{-3} = \boxed{240 \text{ mV}}$

(b) :- $V_p = \frac{V_{p-p}}{2} = \frac{240 \text{ mV}}{2} = \boxed{120 \text{ mV}}$

(c) :- $V_{rms} = \frac{V_p}{\sqrt{2}} = \frac{120 \times 10^{-3}}{\sqrt{2}} = 60 \text{ mV}$

(d) :- $T = \text{No. of horizontal div} \times \text{Time/Div}$
 $= 3 \times 10 \times 10^{-3} = \boxed{30 \text{ mS}}$

(e) :- $f = \frac{1}{T} = \frac{1}{30 \times 10^{-3}} = \boxed{0.033 \text{ kHz}}$