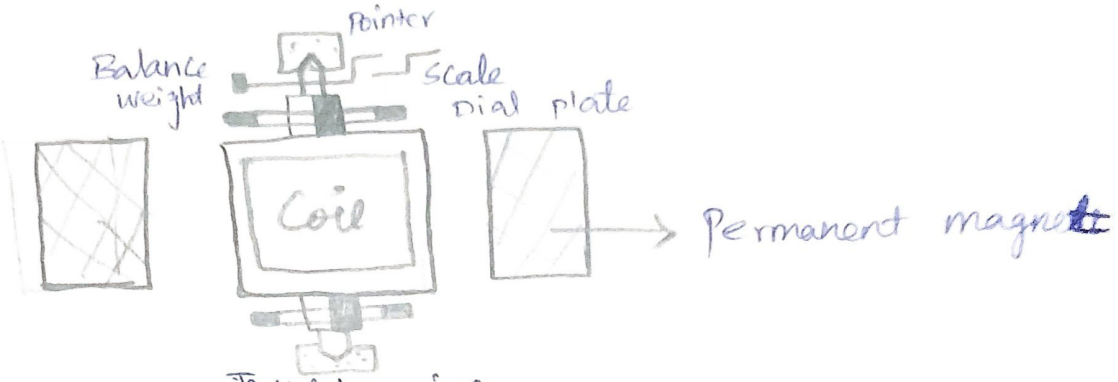
1. Write down the construction, Principle, Working of PMMC Instrument.

Ans:

Principle:

A current carrying coil is placed between the poles of permanent magnet it experienced the force by the Principle of Faraday's law of electromagnetic induction and that force is called deflecting force (or) deflecting torque

Construction:



* A current carrying coil is placed between the poles of permanent magnets.
* A poles is fixed outside of the coil, that coils gives the stationary magnetic fields.
* control torque is provided by two phosphor bronze hair springs. These springs also serve as leads to the coil.
* Eddy current damping is produced by the movement of alluminium former moving in the magnetic fields of the permanent magnet.
* The pointer is carried by the spindle and moves over a graduated scale.

Working:

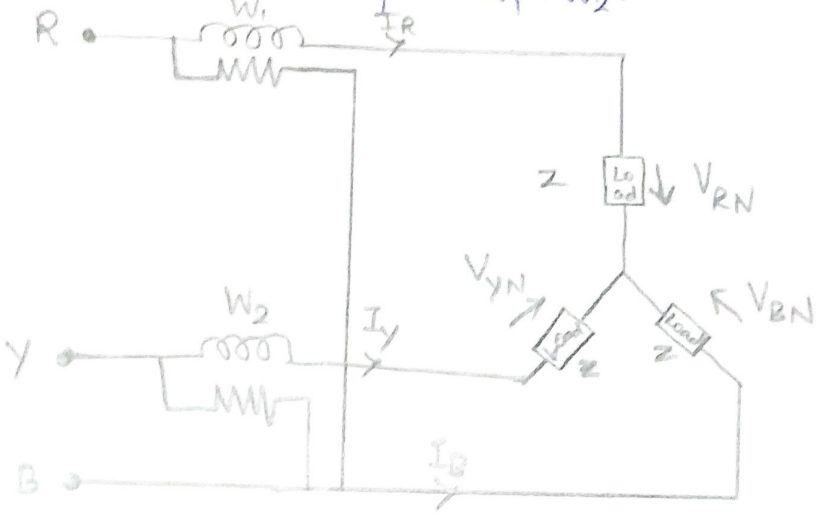
* A permanent magnet creates a stationary magnetic field. When a current from the source flows through a coil suspended with in this field, it experiences a force based on the Fleming's left hand rule.
* Deflection torque - The torque which is required to move the pointer is called deflecting torque.
* Controlling torque - The opposition force given to the pointer to stand at steady point.
* Equilibrium - The pointer stops moving when Deflection is equal to the controlling torque.
* then measure the readings.

2. Describe the measurement of 3 ϕ power using 2 watt meter method.

dm:

Principle

* The two-wattmeter method measures total 3 ϕ by summing the readings of two wattmeters.
* To connect the instruments, the current coils of the wattmeters, which is placed in any two lines, and the potential coils are connected to the third line. The total power is calculated as $P = W_1 + W_2$.



* The load is considered as an inductive load. The three voltages V_{RN}, V_{YN} and V_{BN} are displaced by an angle of 120°.
* Now, the current flowing through the current coil of the wattmeter, W_1 will be given as $W_1 = I_R$.
* potential difference across the potential coil of the wattmeter, W_2 will be

$$W_1 = V_{RB} = V_{RN} - V_{BN}$$

* Therefore the power measured by the wattmeter, W_1 is

$$W_1 = V_{RB} I_R \cos(30° - \phi).$$

* Similarly, we found the W_2 value is

$$W_2 = V_{YB} I_Y \cos(30^\circ + \phi)$$

* Since the load is in balanced condition, here

$$I_R = I_Y = I_B = I_L \text{ and}$$

$$V_{RY} = V_{YB} = V_{BR} = V_L$$

$\Rightarrow$ $W_1 = V_L I_L \cos(30^\circ - \phi)$ and $W_2 = V_L I_L \cos(30^\circ + \phi)$

Now, the sum of two wattmeter readings will be given as

$$W_1 + W_2 = V_L I_L \left[\cos(30^\circ - \phi) + \cos(30^\circ + \phi)\right]$$

(or)

$$W_1 + W_2 = V_L I_L \left[\cos 30^\circ \cos\phi + \sin 30^\circ \sin\phi + \cos 30^\circ \cos\phi - \sin 30^\circ \sin\phi\right]$$

(or)

$$W_1 + W_2 = V_L I_L \left(2 \cos 30^\circ \cos\phi\right)$$

(or)

$$W_1 + W_2 = V_L I_L \left[2 \frac{\sqrt{3}}{2} \cos\phi\right]$$

$$W_1 + W_2 = \sqrt{3} V_L I_L \cos\phi$$

$$\boxed{W_1 + W_2 = P}$$

3. Explain the digital storage oscilloscope (DSO), with block diagram.