Experiment No. Date: ……/……/20.....

TO DETERMINE THE FREQUENCY OF AC MAINS BY USING A SONOMETER

APPARATUS REQUIRED:

1. A sonometer with two bridges 2. String 3. Slotted load
4. Ac power supply and a Step down transformer
5. U-shaped or horse shoe magnet
6. Micro meter screw gauge
7. Connecting wires

THEORY:

The sonometer is an instrument used for demonstrating the relationship between the frequency of the sound that is produced by the string when it is plucked and the tension, length, and mass per unit length of the string.

Basically, a sonometer is a device based on the principle of Resonance.

"When the frequency of the applied force is equal to the natural frequency of the body, the body vibrates with very large amplitude". Corresponding intensity of sound will be maximum**. This phenomenon is known as resonance**

A sonometer can be used:

1. to verify the laws of vibration of stretched string
2. to determine the wavelength of sound.
3. to determine the frequency of tuning fork.
4. to measure the mass per unit length or density of a wire.

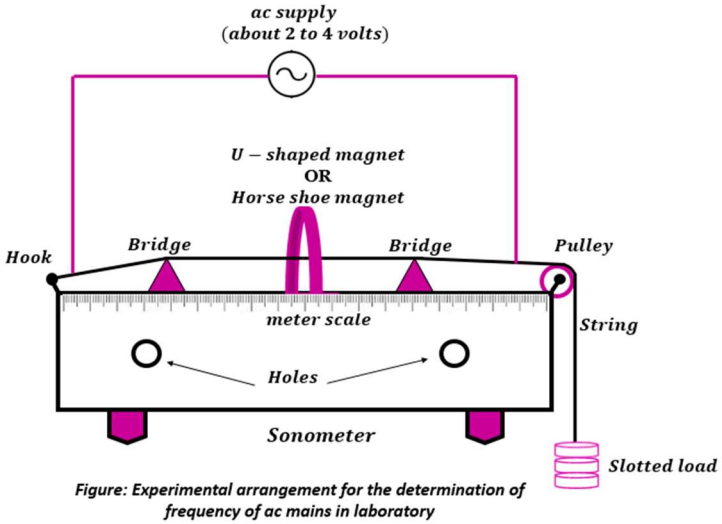

Figure: Experimental arrangement for the determination of frequency of ac mains in laboratory

Construction:

- **The Wire, Weights and Pulley Apparatus:**
  A wire is stretched along the sound box, between the hook (hinge) and the pulley. The wire turns around the pulley to let a weight hang on the end of the wire.
- **The Sound box (A hollow wooden box):**
  The sound box is a cuboidal box made of wood, upon which other parts of the sonometer are built. ***The function of the sonometer box is to amplify the sound of the tuning fork***. The sonometer box also has a graduated ruler along its length to measure distances on the box.
  There are holes kept on one side of the sonometer box. ***The holes in the sonometer box act as a way through which the frequency of vibration of the string is communicated inside the hollow portion of the box.***
- **The Knife Edges (bridges):**
  The bridges are made to let the user change the length of the wire responsible for producing standing waves. So, ***changing the positions of the bridges changes the wavelength of the standing waves.***

Working:

The wire (string) is stretched along the sound box, between the hook (hinge) and the pulley with slotted weight suspended at free end, as shown in figure. The wire is subjected to external magnetic field via U-shaped magnet. When an alternating current is passed through the wire, it experiences Lorentz force. This Lorentz force causes the string to oscillate. On adjusting the positions of the bridges to a particular separation (length), the string begins to vibrate with maximum amplitude (resonance is observed).

(***At resonance, the frequency of vibration of the string is equal to the frequency of ac mains.***).