IARE

INSTITUTE OF AERONAUTICAL ENGINEERING

(An Autonomous Institute affiliated to JNTUH, Hyderabad)

Dundigal, Hyderabad - 500 043

LABORATORY WORK SHEET

Name of the Student :.....

Class..... Semester..First

Course Code :AHSD09 Course Name :AP Lab

Roll Number										

Name of the Course Faculty..... Faculty ID :.....

Exercise Number :..... Week Number :..... Date :.....

DAY TO DAY EVALUATION:

Marks	Aim / Preparation	Algorithm / Procedure / Performance in the Lab	Source Code / Calculations and Graphs	Program Execution / Results and Error Analysis	Viva - Voce	Total
Max. Marks	4	4	4	4	4	20
Obtained						

Signature of Faculty

START WRITING FROM HERE :

Melde's experiment - Longitudinal waves

Introduction :

The experiment by melde is a scientific experiment carried out in 1859 by the German Physicist Franz Melde on the standing waves produced in a tense cable originally set oscillating by a tuning fork, later improved with connection to an electric vibrator. This experiment, "a lecture room standby", attempted to demonstrate that mechanical waves undergo interference phenomenon. Mechanical waves travelled in opposite directions form immobile points, called nodes. These waves were called

ROLL NUMBER :

standing waves by Melde since th position of th nodes and loops (points where th cord vibrated) stayed static.

Objective

Educational :

Melde's experiment is ideal to study th behavior of standing waves. Students can even visually determine wavelength, period and amplitude of waves.

A string undergoing transverse vibration illustrates many features common to all vibrating acoustic systems just like th vibrations of a violin or guitar string.

Experimental :

To determine th frequency of a tuning fork in longitudinal mode and transverse mode using Melde's arrangement.

Pre - Lab

Reading:

Read about longitudinal waves and transverse waves and understand th laws of stretched strings.

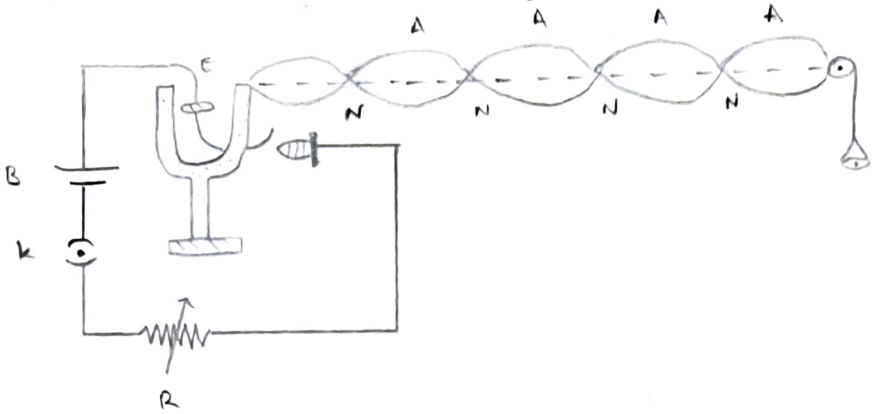
Written :

Keep th worksheet ready with required write up, formulae, tabular columns and theoretical values.

ROLL NUMBER :

Apparatus required

Melde's arrangement, rheostat, plug keys, connecting wires, meter scale, thread, weight box, power supply.



Principle

Frequency of tuning fork $n = \frac{1}{l}\sqrt{\frac{T}{m}}$ H_z

m- Mass per unit length

T = tension = $(M+m) \times g$

l = Length of a single loop

Procedure

In longitudinal mode, the tuning fork is parallel to the vibrating thread. Set the Melde's experiment in the longitudinal mode of vibrations and note the observations in observation table for different lengths. Calculate the frequency of the tuning fork by using the formula.

Observations

Mass of the thread (w) = gm, Length of thread (y) = cm

Mass of the pan (p) = gm, Linear density = gm/cm

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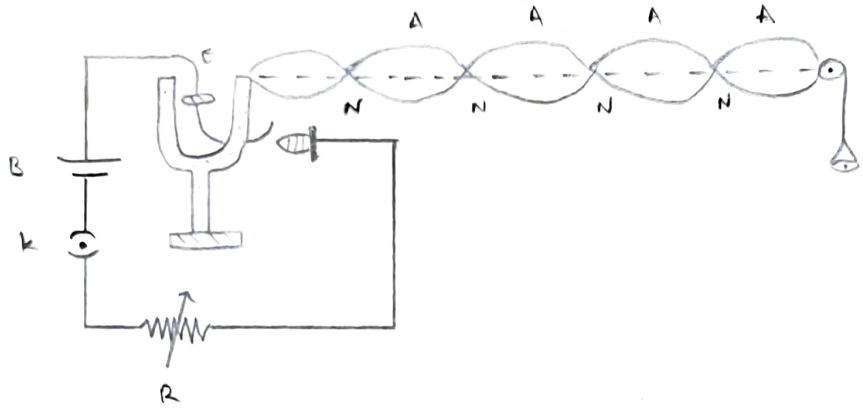

Principle

Frequency of tuning fork $n = \frac{1}{l}\sqrt{\frac{T}{m}}$ Hz

m- Mass per unit length

T = tension = $(M+m) \times g$

l = Length of a single loop

Procedure

In longitudinal mode, the tuning fork is parallel to the vibrating thread. Set the Melde's experiment in the longitudinal mode of vibrations and note the observations in observation table for different lengths. Calculate the frequency of the tuning fork by using the formula.

Observations

Mass of the thread (w) = gm, Length of thread (y) = cm

Mass of the pan (p) = gm, Linear density = gm/cm

ROLL NUMBER :

Observation table

S.no.	Load applied in the pan	Tension	no. of loops	length of x loops	length of each loop $l = d/x$	$\sqrt{T}$	$\frac{\sqrt{T}}{l}$	$n = \frac{1}{L}\sqrt{\frac{T}{m}}$
1								
2								
3								
4								
5								

Average of n =

Precautions

1. The thread should be uniform and inextensible.
2. Well defined loops should be obtained by adjusting the tension with milligram weights.
3. Frictions in the pulley should be least possible.

Result

Frequency of the tuning fork in longitudinal mode ____ Hz.

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START WRITING FROM HERE :

Viva Voce

1. What is frequency?

Number of cycles completed by wave in unit time.

2. Difference between longitudinal and transverse waves?

ans In longitudinal waves, propagation and vibration are parallel in transverse, its ⊥.

3. What is node?

ans Point of least amplitude.

4. What is anti-node?

ans Point of maximum amplitude.

ROLL NUMBER :

5. What are standard waves ?

Standard waves are also called stationary waves, combination of 2 waves moving in a particular direction each having the same amplitude and frequency.

6. What is resonance ?

Resonance describes the phenomenon of increased amplitude and frequency that occurs when the frequency of a periodically applied force is equal and the close to a natural frequency of the system on which it acts.

7. Explain the importance of Melde's Experiment.

Melde's experiment is ideal to study the behavior of standing waves.

8. Give some important applications of Melde's Enperiment.

A string undergoing transverse vibration illustrate many features common to all vibrating acoustic systems just like the vibrations of a violin or guitar string.

9. Define Resonance condition.

Resonance describes the performance of increased amplitude that occurs when frequency of applied force is equal to natural frequency.

ROLL NUMBER :

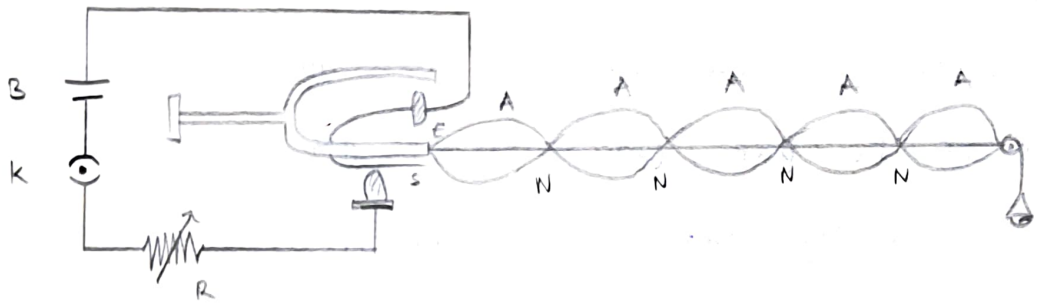
Melde's Experiment - Transverse Waves

Objective :

To determine the frequency of a tuning fork in transverse mode using Melde's arrangement.

Apparatus Required :

Melde's arrangement, rheostat, plug keys, connecting wires, meter scale, thread, weight box, power supply.



Principle :

Frequency of tuning fork $n = \frac{1}{2l}\sqrt{\frac{T}{m}}$ Hz

m - Mass per unit length

T - tension = $(M+m) \times g$

l - length of a single loop

Procedure :

In transverse mode, the tuning fork is made to vibrate perpendicular to vibrating thread. The vibrating thread forms many well defined loops. These loops are due to the stationary vibrations set up as a result of the superposition of the progressive wave from the prong and the reflected wave from the pulley. The frequency of each segment coincides with the frequency of the fork.

ROLL NUMBER :

Set the Melde's experiment in transverse mode vibrations with 2-3 meters length of thread and note the number of loops and length of the thread are recorded in observations table. Repeated the same procedure for different length and recorded in the observation table and calculated the frequency of the tuning fork.

Observations :

Mass of the thread (w) = gm

Length of the thread (y) = cm

Mass of the pan (p) = gm

Linear density (m) = gm/cm.

observation table :

S.no	Load applied in the pan	Tension	No. of loops (x)	Length of x loops (d)	length of each loop $l = d/x$	$\sqrt{T}$	$\frac{\sqrt{T}}{l}$	$\eta_t = \frac{1}{2l}\sqrt{\frac{T}{m}}$

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START WRITING FROM HERE :

Precautions :

1. The thread should be uniform and inextensible.
2. Well defined loops should be obtained by adjusting the tension with milligram weights.
3. Frictions in the pulley should be least possible.

Result :

Frequency of the tuning fork in transverse mode ____ Hz.

ROLL NUMBER :

Probing further experiments :

1. Verify th laws of stretched strings : Frequency is directly proportional to th square root of tension applied.
2. Verify th law that frequency is inversely proportional to th length of th string.