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Name N. Amritha Varshini Class Mech 'A' Year Ist (II SEM)

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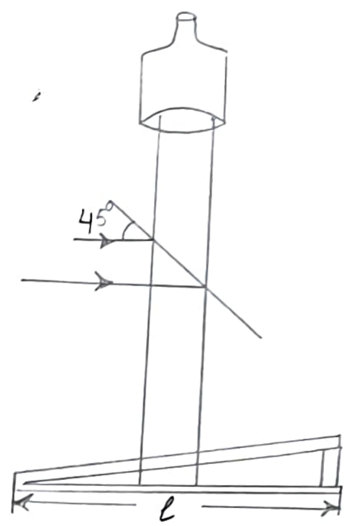
FIGURE:



OBSERVATION:

Least count of the travelling microscope:

Value of one main scale division = 0.05 cm

No of vernier scale division = 50 cm

$L.C = \frac{\text{Value of 1 M.S.D}}{\text{Total number of V.S.D.}} \quad \frac{0.05}{50} : 0.01$ cm.

To determine fringe width "β":

FRINGE NO.	TM READINGS R_1 in cm	FRINGE No.	TM READINGS R_2 in cms	WIDTH OF 10 FRINGES $R_1 \sim R_2$ in cm	FRINGE WIDTH $\beta = (R_1 \sim R_2)/10$ in cm.
n	9.355	n+10	9.188	0.167	0.0167
n+2	9.352	n+12	9.158	0.194	0.0194
n+4	9.357	n+14	9.189	0.168	0.0168
n+6	9.347	n+16	9.055	0.292	0.0292
n+8	9.159	n+18	9.084	0.075	0.0075

Average fringe width = β = 0.01792×10^{-2}

Distance between paper and point of contact of glass plate $I = 0.04$ m.

Name of Experiment. INTEFERENCE AT A WEDGE (AIR WEDGE)
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AIR WEDGE

AIM:

To determine the thickness of a paper strip by producing interference pattern.

APPARATUS:

Two optically plane glass plates, reflecting glass plate fixed to a stand, sodium vapour lamp, travelling microscope, small piece of paper, reading lens etc.

FORMULA:

The thickness of the paper is given by

$$t = \frac{\lambda l}{2\beta} \text{ m.}$$

where λ = wavelength of sodium light = 5893×10^{-10} m.

l = distance between the paper and the point of contact of the two glass plates (m).

β = Average fringe width (m).

PROCEDURE:

→ The given piece of paper whose thickness is to be measured is placed between the 2 glass plates so that a thin film of air is formed between the plates.

→ The travelling microscope is placed such that its objective is directly above the optically flat glass plates. The inclined glass plates is tilted such that the field of view is brightly

CALCULATIONS:

$9.35 + 0.001 \times 5 = 9.355$

$9.35 + 0.001 \times 2 = 9.352$

$9.35 + 0.001 \times 25 = 9.375$

$9.35 + 0.001 \times 47 = 9.347$

$9.15 + 0.001 \times 9 = 9.159$

$9.115 + 0.001 \times 56 = 9.188$

$9.15 + 0.001 \times 8 = 9.158$

$9.15 + 0.001 \times 39 = 9.189$

$9.05 + 0.001 \times 5 = 9.055$

$9.084 = 9.05 + 0.001 \times 34 = 9.084.$

$$\frac{5893 \times 10^{-10} \times 0.04}{2 \times 0.01792 \times 10^{-2}}$$

$$= \frac{235.72 \times 10^{-10}}{0.03584 \times 10^{-2}}$$

$$= 6577.00 \times 10^{-8}$$

$$= 65.77 \times 10^{-6}$$

$\times 10^{-6}\,m$

70

60

Airwedge

Name of Experiment.. Date..
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illuminated by monochromatic light from sodium vapour lamp.

→ The focus of the travelling microscope is such that the alternate dark and bright fringes is clearly seen in the field of the view of microscope.

→ With the help of tangential screw, the cross-wire of the microscope is made to co-incinde with any of the dark fringe taken as the n^{th} fringe and the microscopic reading is taken.

→ Again by means of the tangential screw, the cross-wire is made to co-incide with every alternate dark fringe upto the $(n+18)^{th}$ fringe and the corresponding microscope readings are noted. The readings are tabulated as shown in the tabular column and the average fringe width is calculated.

The distance between the piece of the paper and the line of contact of the two glass plates is measured with the help of a meter scale. Knowing the wavelength of sodium light, the thickness of the given paper piece is calculated using the rotation.

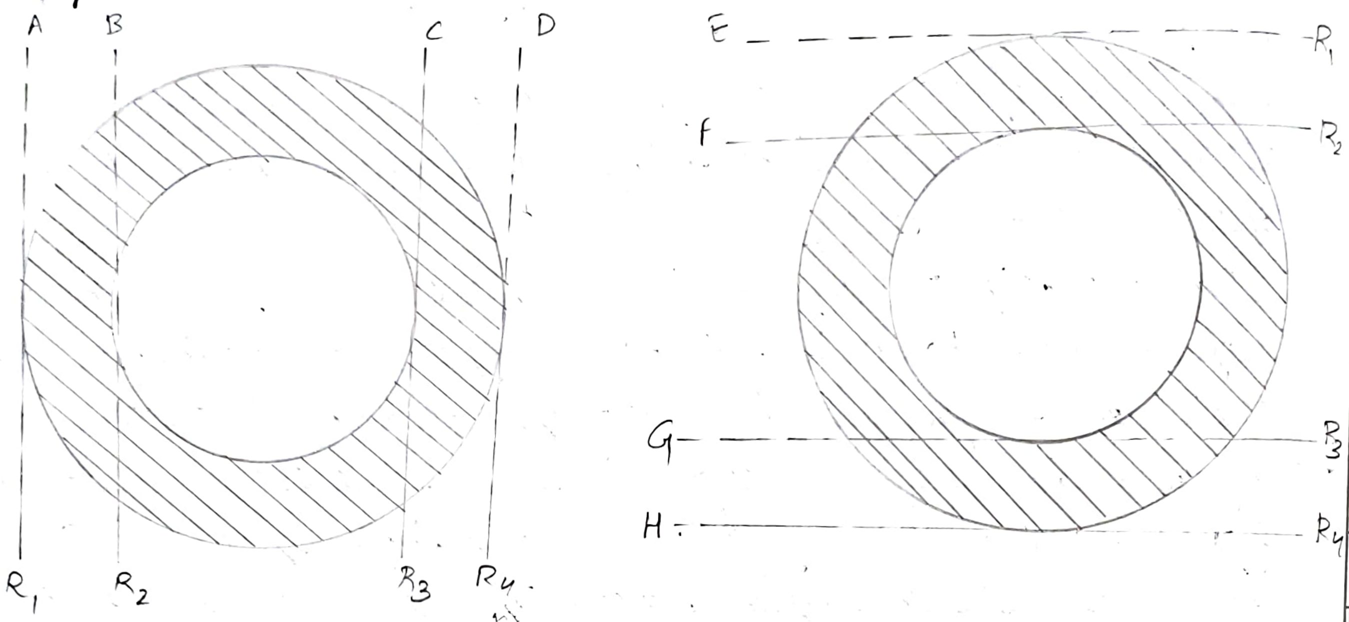
$$t = \frac{\lambda l}{2\beta}.$$

RESULT:

Thickness of the given paper = 65.77×10^{-6} m.

24/8/22

FIGURE:



OBSERVATION

Least count of the travelling microscope :

Value of one main scale division = 0.05 cms.

No of veenier scale division = 50

$$LC = \frac{\text{Value of 1 MSD.}}{\text{Total number of V.S.D}} = 0.001 \text{ cms.}$$

To determine external radius R and internal radius r:

Position of TM	TM Readings in cms	External diameter D = R4 − R1 (cms)	Internal diameter D = R3 ~ R2 (cms)	External radius R = D/2 (in cms)	Internal Radius r = D/2 (in cms)
HORIZONTAL TRAVERSE	R_1 = 6.357 R_2 = 6.363 R_3 = 6.713 R_4 = 6.894	0.537	0.350	0.2685	0.1750

Name of Experiment: DENSITY OF GLASS. Date: 7/9/2022

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DENSITY OF GLASS.

AIM:

To determine the density of the material of the capillary tube using a travelling microscope.

APPARATUS:

Capillary tube, travelling microscope, stand, physical balance etc.

FORMULA:

The density of the material of the capillary tube is given by.

$$\rho = \frac{M}{\pi(R^2-r^2)L} \ kg/m^3$$

Where M = Mass of the capillary tube, kg.
R = External Radius of the capillary tube, m.
r = Internal radius of the capillary tube, m.
L = Length of the capillary tube, m.

PROCEDURE:

→ The given capillary tube is placed horizontally on a stand and is kept in position by means of wax. The travelling microscope is focused on the capillary tube such that the image of the cross section of the tube is clearly seen.

→ The microscope is focused and adjusted in such a manner that the vertical crosswire is tangential to the cross-section of the capillary tube at point A and reading R_1 is taken on the horizontal scale. Similarly the reading R_2, R_3, R_4 corresponding to the points B, C, D are taken on the horizontal scale

Position of TM.	TM Reading in cms.	External Diameter $D = R_4 \sim R_1$ (in cms)	Internal Diameter $D = R_3 \sim R_2$ (in cms)	External Radius $R = D/2$ (in cms)	Internal Radius $r = D/2$ (in cms)
VERTICAL TRAVERSAL	$R_1 = 7.384$ $R_2 = 7.306$ $R_3 = 6.873$ $R_4 = 6.716$	0.668	0.433	0.334	0.2165.

$R_{mean} = 0.30$ cms.

$r_{mean} = 0.19$ cms.

$R = 0.30 \times 10^{-2}$ m.

$r = 0.19 \times 10^{-2}$ m.

To determine length L of the tube.

Trial. No	Reading at one end of the tube 'a' in cm	Reading at the other end of the tube 'b' in cm.	Length of the tube $L = a - b$. in cms.
1	1 cms.	15.6	14.6

Mass of the capillary tube $= 6.393 \times 10^{-3}$ kg.

Mean length $L = 14.6$ cms. $= 14.6 \times 10^{-2}$ cms.

Density $= 2.58 \times 10^{+3}$ kg/m³

2.58×10^{-3}

2587220.

2.58×10^{3} kg/m³.

$$\frac{6.393 \times 10^{-3}}{3.14 \times (0.30 \times 10^{-2} - 0.19 \times 10^{-2})^2 \times 14.6 \times 10^{-3}}$$

$$\frac{6.393 \times 10^{-3}}{55471 \times 10^{-8}}$$

2587

2.587×10^{3} kg.

Name of Experiment.. Date...

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→ The travelling microscope is then adjusted for vertical traverse and the readings R_1, R_2, R_3, R_4 corresponding to the points E, F, G and H are taken on the vertical scale. The readings are tabulated and the mean external and internal radius of the capillary tube is calculated.

→ The length L of the capillary tube is measured by coinciding the point of intersection of the crosswire with the ends of the tube. The mass M of the capillary tube is determined using a physical balance. The density of the material of the capillary tube is the calculate using the formula.

$$\rho = \frac{M}{\pi(R^2-r^2)L}$$

RESULT : The density of the given capillary tube.

$= 2.58 \times 10^{+3}$ kg/m³

FOCUS INFINITY
30 max
ISO, 1000
WB, 4200K

7/9/22

2.58×10^{3} kg/m³

density

Length

OBSERVATIONS:

Mass of one of the slotted weight, $m = 200 \times 10^{-3}$ kg

Length of the wire between the two chucknuts, $l = 20.3 \times 10^{-2}$ m

Distance of the slotted weights in (m)	Time for 10 oscillations in seconds.				Period T in secs.
	Trial 1	Trial 2	Trial 3	Mean.	
x_1 = 5cms.	36	36	36	36	T_1 = 3.6
x_2 = 10cms.	42	42	42	42	T_2 = 4.2
x_3 = 15cms	52	53	51	52	T_3 = 5.2.

To determine radius of the wire: (using screw gauge).

$$\text{Pitch} = \frac{\text{Distance moved on the pitch scale.}}{\text{No of rotations given to the head scale}} = 1\text{ mm}$$

$$LC = \frac{\text{Pitch.}}{\text{No of divisions on the headscale.}} = 0.01\text{ mm.}$$

Zero error = 0 divisions.
Zero corrections = 0 divisions.

Trial No	P.S.R	H.S.R	Corrected H.S.R C.H.S.R	Diameter in mm. d= PSR + (CHSR × LC)
1	0	88	88	0.88×10^{-3}
2	0	88	88	0.88×10^{-3}
3	0	89	89	0.89×10^{-3}
4	0	88	88	0.88×10^{-3}

Mean diameter = 'd' = 0.88 mm. Radius of the wire = $d/2$ = 0.44 mm = 0.44×10^{-3} m

Name of Experiment: RIGIDITY MODULUS - DYANAMIC METHOD. Date: 7/9/2022

Experiment No. 3

Experiment Result:

Page No.

AIM:

To determine the rigidity modulus of the material of a wire by dynamic method.

APPARATUS:

Given wire, uniform rectangular wire / bar, two identical slotted weights, stand, stop clock, screw gauges, pointers etc.

FORMULAS:

The rigidity modulus of the material of a wire is given by

$$n = \frac{16\pi l m (x_2^2 - x_1^2)}{r^4 (T_2^2 - T_1^2)} \text{ N/m}^2 \quad \frac{16\pi l m}{r^4}\left[\frac{x_2^2 - x_1^2}{T_2^2 - T_1^2} + \frac{x_1^2 - x_3^2}{T_1^2 - T_3^2} + \frac{x_3^2 - x_2^2}{T_3^2 - T_1^2}\right]$$

where $\times 10^{0}$

l = Length of the wire between the two chucknuts, m.

m = Mass of one of the slotted weight, kg

x_1, x_2 = Distance of the slotted weights from the axis of suspension, m.

r = Mean radius of the wire, m.

T_1 = Time period when the slotted weight is at a distance x_1 from the axis of suspension, secs.

T_2 = Time period when the slotted weight is at a distance x_2 from the axis of suspension, secs.

PROCEDURE:

→ The given wire whose rigidity modulus is to be determined is taken and their free ends are connected to the chucknuts. One end of the chucknuts is rigidly clamped to a stand and

CALCULATIONS.

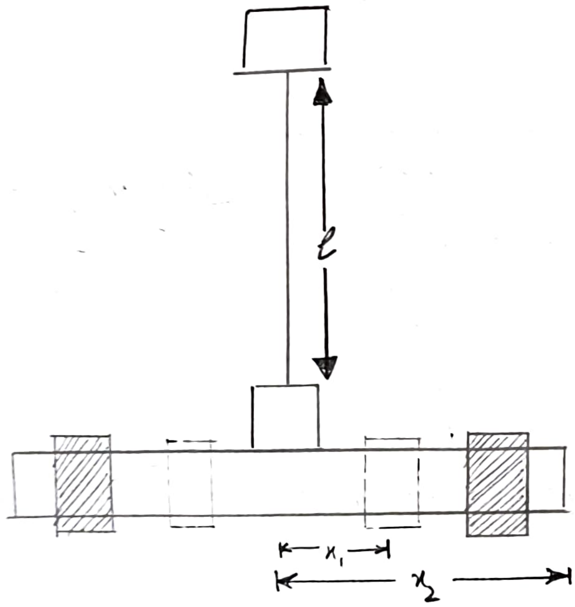
$$\frac{16\times 3.14\times 20.3\times 10^{-2}\times 200\times 10^{-3}}{(0.44\times 10^{-3})^4}\times\left[\frac{\frac{[15^2-5^2]}{[5.2^2-3.6^2]}+\frac{[15^2-10^2]}{[5.2^2-4.2^2]}+\frac{[10^2-5^2]}{[4.2^2-3.6^2]}}{3}\right]$$

$$\frac{2.039744}{0.037\times 10^{-12}}\left[\frac{200}{14.08}+\frac{125}{9.4}+\frac{75}{4.68}\right]$$

$$5.5128\times 10^{12}\times 14.50866.$$

$$\underline{7.9\times 10^{10}\ N/m^2}$$

FIGURE



Name of Experiment.. Date.. Page No.

Experiment No.. Experiment Result..

the other end of the chucknut is clamped to the centre of the rectangular bar as shown in figure.

→ Two slotted weights each of mass 100 gms are placed on the rectangular bar at equal distances ($x_1 = 5$cms) from the centre of the bar. The chucknut screwed to the rectangular bar is rotated through a small angle so that the bar executes torsional oscillations.

→ Using a stop clock the time taken for 10 oscillations is noted down thrice and the time period T_1 is calculated. The experiment is repeated by changing the distance of the symmetrical masses from the suspension wire to x_2 (say 10 cms) and the corresponding time period t_2 is found out.

→ The length 'l' of the wire between the two chucknuts is measured using a metre scale.

→ The radius of the wire is determined using a screw gauge. The rigidity modulus of the material of the wire is then calculated using the formula

$$\frac{16\pi l m}{r^4}\left[\frac{x_2^2-x_1^2}{T_2^2-T_1^2} + \frac{x_1^2-x_3^2}{T_1^2-T_3^2} + \frac{x_3^2-x_2^2}{T_3^2-T_1^2}\right]$$

RESULT:

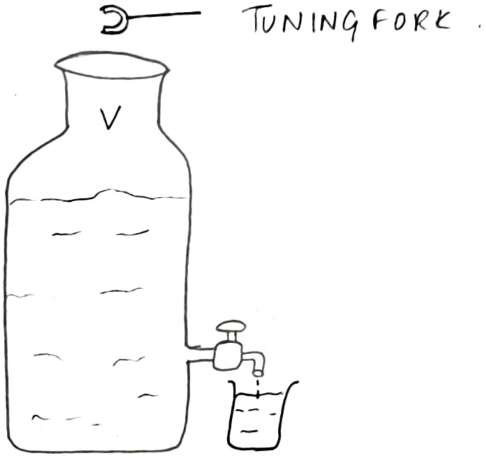
The rigidity modulus of the material of the given wire

$= 7.9 \times 10^{10}$ N/m^2

range 6-7

4/9/22

FIGURE :



$\sqrt{\frac{n^2 V}{V_x}}$

Frequency of tuning fork 'n' in hertz	volume of water collected 'V' in $m^3 \times 10^{-6}$				$n^2 v$.
	Trial 1	Trial 2	Trial 3.	Mean	
480	106	104	106 .	105.33	24.26
426.6	135	134	135	134.66	24.50
320	245	246	246	245.66	25.15
288	324	325	323	324.00	26.87
x	216	214	216	215.33	25.19.

$(n^2 v)_{mean} = 25.195$

Name of Experiment: VOLUME RESONATOR. Date: 21/9/2022

Experiment No. 4. Experiment Result: Page No.

VOLUME RESONATOR.

AIM:

To determine the unknown frequency of tuning fork using a volume resonator.

APPARATUS REQUIRED.

Aspirator bottle, tuning fork, beaker, measuring jar, rubber pad etc.

FORMULA:

The unknown frequency of the tuning fork is given by

$$n_x = \sqrt{\frac{(n^2 V)_{mean}}{V_x}} \text{ Hertz}$$

where n = Frequency of known tuning fork.

V = Volume of air cavity/water of the resonator corresponding to tuning fork of the known frequency, m^3

V_x = Volume of air cavity/water of the resonator corresponding to tuning fork of unknown frequency.

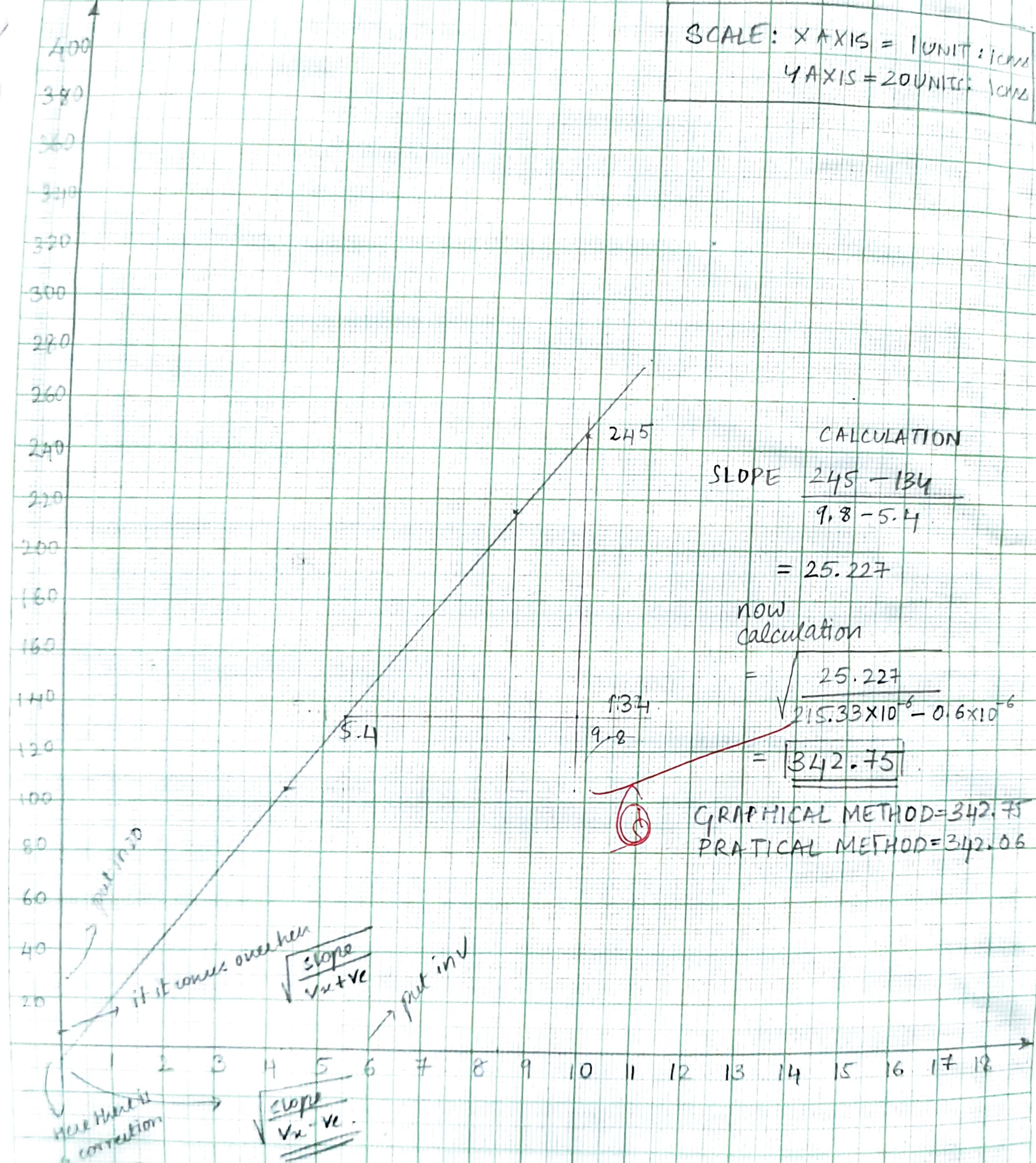
PROCEDURE:

→ The apparatus is set up as shown in the figure. The aspirator bottle is filled with water upto the neck. A tuning fork of the known frequency is excited by stirring and striking it gently on a rubber pad. The excited fork is held near the mouth of the bottle.

→ At the same time, by opening the pinch cock, water is allowed to flow out gradually into a beaker until resonance occurs and maximum sound occurs.

→ The volume V of the water collected is collected in a measuring jar and measured. The volume of the water gives the volume of the air in the bottles which resonates with the tuning fork.

SCALE: X AXIS = 1 UNIT : 1 cm
Y AXIS = 20 UNITS : 1 cm



$\sqrt{\dfrac{\text{slope}}{V_x + V_e}}$

$\sqrt{\dfrac{\text{slope}}{V_x \cdot V_e}}$

CALCULATION

SLOPE $\dfrac{245 - 134}{9.8 - 5.4}$

$= 25.227$

now calculation

$= \sqrt{\dfrac{25.227}{215.33 \times 10^{-6} - 0.6 \times 10^{-6}}}$

$= \boxed{342.75}$

6

GRAPHICAL METHOD = 342.75
PRATICAL METHOD = 342.06

Name of Experiment.. Date...

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→ Water is poured back to the aspirator bottle upto the neck. The above procedure is repeated and the mean value of volume v is found. The experiment is repeated with other tuning forks of different frequencies of known frequency and in each case n^2v is calculated.

→ The experiment is then performed with the tuning fork whose frequency is yet to be determined. Let the mean value of the volume collected in this case be V_x. The unknown frequency of the tuning fork is calculated using the formula

$$n_x = \sqrt{\frac{n^2(v)_{mean}}{V_x}}.$$

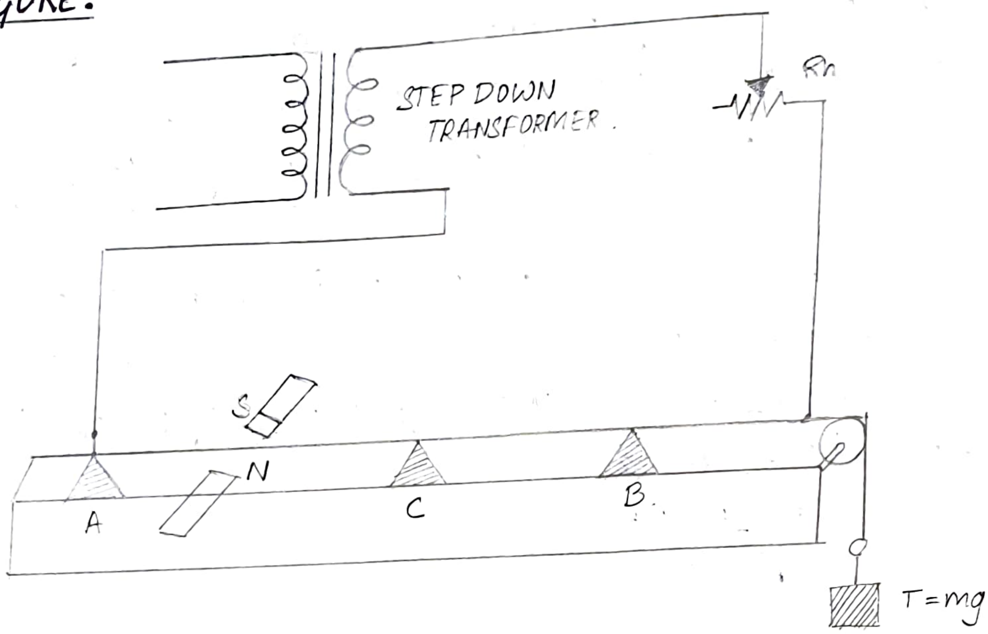
RESULT:

Result of the given tuning fork I: 342.06 Hertz. (Theoritical / Pratical formula method).

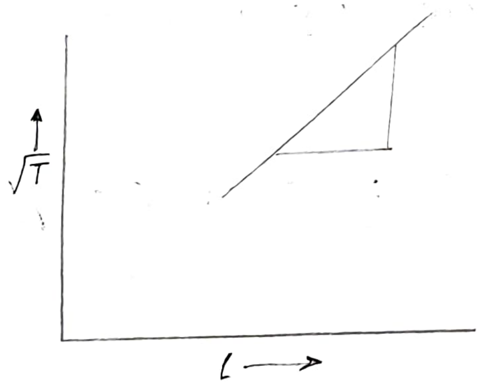
II : 342.75 (Graphical method).

21/09

FIGURE:



GRAPHICAL METHOD:



A graph is drawn by plotting "$\sqrt{T}$" along the Y axis and "l" along the x axis. The slope of the straight line $(\sqrt{T}/l)$ is calculated. Knowing the value of the slope, the frequency of AC suppy is calculated using the formula.

$$n = \frac{1}{2\sqrt{m}} \times \text{slope}.$$

Name of Experiment.......................... Date.......................... Page No.

Experiment No. 5 Experiment Result..........................

FREQUENCY OF AC USING SONOMETER

AIM:

To determine the frequency of the Alternating Current by using Sonometer.

APPARATUS:

Sonometer, step down transformer, rheostat, two bar magnets, weights etc.

$\frac{1}{2\sqrt{m}} \left[\frac{\sqrt{T}}{l}\right]$

FORMULA:

The frequency of AC supply is given by

$$n = \frac{1}{2\sqrt{m}}\left[\frac{\sqrt{T}}{l}\right]_{mean} \quad [\text{Hertz}]$$

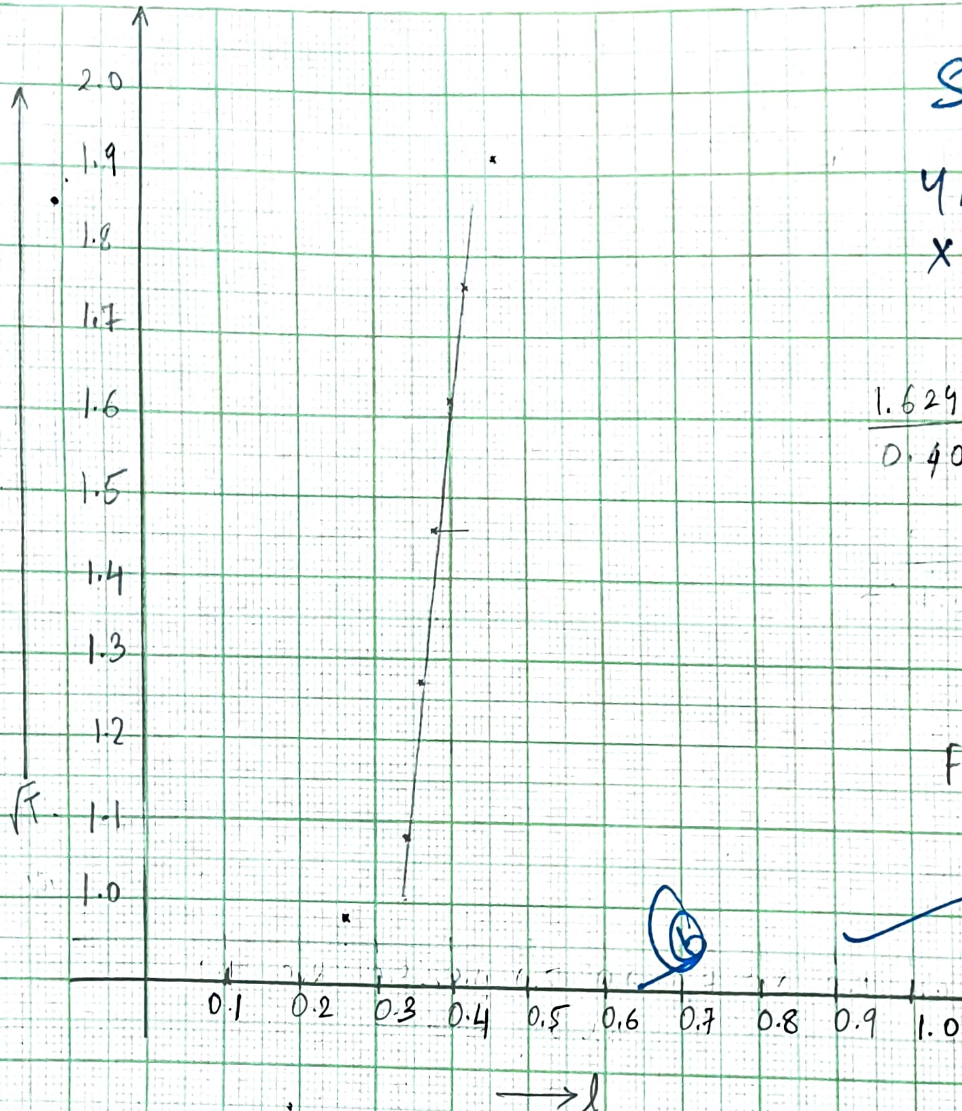
where T = Tension in the wire, Newtons.

m = Mass per unit length of the wire, kg/m.

l = Length of the vibrating segment, m.

PROCEDURE:

The electrical connections are made as shown in the figure. The 2 bar magnets are placed between the fixed bridge A and movable bridge C on the sonometer such that their opposite poles face each other. To start with, a suitable load is attached to the weight hanger and the position of the movable bridge is adjusted till the segment AC vibrates with maximum amplitude. The length of the vibrating segment AC is measured using a meter scale. Knowing the mass of the load (including the weight hanger) the tension in the wire is calculated. The experiment is repeated for different tension "T" by adding



Scale!

Y AXIS = 1cm = 0.1 UNIT
X AXIS = 1cm = 0.1 UNIT

$$\frac{1.624 - 1.288}{0.40 - 0.36} = 3.60$$

$$\frac{3.60}{2 \times \sqrt{1.204 \times 10^{-3}}}$$
$$= 52\,Hz.$$

Frequency by graphical method is 52Hz

TRIAL NO.	MASS IN THE WEIGHT HANGE 'M' in kg	TENSION T = m×g in N	LENGTH OF VIBRATING SEGMENT	$\sqrt{T}$	$\sqrt{T}/L$ IN NEWTON / m.
1	69.45×10^{-3}	680.61	26×10^{-2}	0.824	3.169
2	119.45×10^{-3}	1170.61	34×10^{-2}	1.081	3.179
3	169.45×10^{-3}	1660.61	36×10^{-2}	1.288	3.577
4	219.45×10^{-3}	2150.61	38.5×10^{-2}	1.466	3.807
5	269.45×10^{-3}	2640.61	40.3×10^{-2}	1.624	4.029
6	319.45×10^{-3}	3130.61	42.4×10^{-2}	1.769	4.172
7	369.45×10^{-3}	3620.61	46.6×10^{-2}	1.902	4.099

Mean = 3.719.

Mass of the wire m = 1.204 g.

Length of the wire = 1 m.

Mass / unit length of the wire m =

$$\frac{\text{Mass of the wire}}{\text{Length of the wire}} = 1.204.$$

Name of Experiment.. Date...

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by adding different masses in the weight hanger and in each case the length of the vibrating segment is measured. The readings are tabulated and the mean value of $\sqrt{T}/l$ is calculated. The mass per unit length of the sonometer wire is found out by finding the mass of a known length of the wire. The frequency of AC supply is calculated using the formula.

$$n = \frac{1}{2\sqrt{m}}\left[\frac{\sqrt{T}}{l}\right]_{mean}.$$

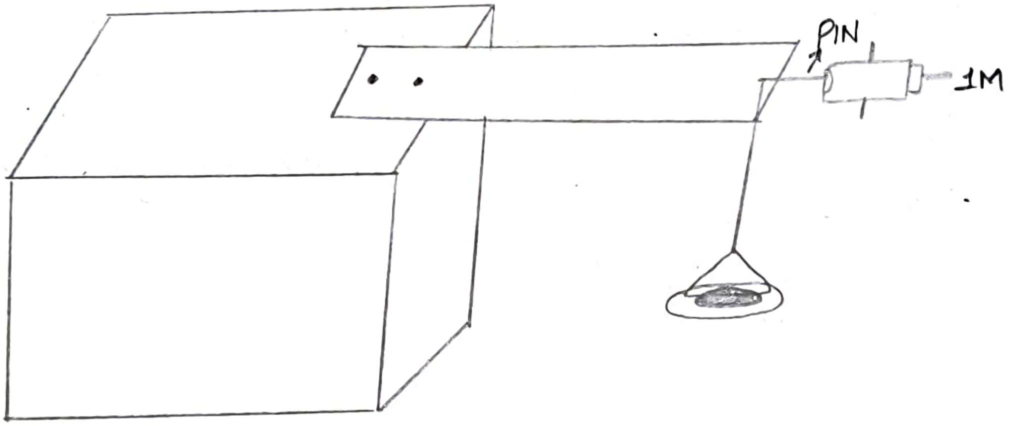
RESULT.

Frequency of A C supply by.
Formula method = 53.58 Hz.
Graphical method = 52 Hz.

10
12/10/22

$\frac{1}{2\sqrt{m}}$

FIGURE :



OBSERVATION:

Least count of the travelling microscope :

Value of one main scale division = 0.05 cms.

No of vernier scale division. 50

LC = 0.001cm

To determine the depression:

Load in gms	TM Readings in cm			Load in gms	TM Readings in cms			Depression for δ for 45 gms in cm $\delta = R_1 - R_2$
	Load increasing	Load decreasing	mean R1		Load Increasing	Load decreasing	mean R2	
15	7.529	7.510	7.519	60	7.143	7.131	7.137	0.382
30	7.393	7.315	7.354	75	6.998	6.954.	6.976	0.378
45	7.215	7.216.	7.215	90.	6.878	6.878.	6.878	0.337

Mean depression $\delta = 0.091$ cms.

$\delta = 0.091 \times 10^{-2}$ m.

$\delta = 0.365 \times 10^{-2}$ m

Name of Experiment.. Date..

Experiment No..........6.. Experiment Result...

Page No.

SINGLE CANTILEVER.

AIM:

To determine the Young's modulus of the material of a bar using it as single cantilever.

FORMULA:

The young's modulus of material of a bar given by

$$q = \frac{4ml^3}{bd^3 s} \ N/m^2.$$

m = Mass of which depression is found, kg

g = Acceleration due to gravity = $9.8 m/sec^2$

l = length of the cantilever from the point of projection to the point where pin is fixed.

d = thickness of bar, m.

δ = mean depression for load of m kg.

PROCEDURE:

One end of a given rectangular bar is fixed firmly to a heavy wooden block and a scale pan is suspended from the other end. A pin is fixed vertically to the bar such that its exactly above the point where scale pan is hung. A load of 10 gm is added to scale pan. A travelling microscope is focused on the tip of the pin is seen.

The microscope is adjusted to find the image such that the tip of pin coincides with the tip of the pin. The load of scale pan is increased in steps 10gms till maximum of 90 is reached.

Length of the cantilever $l = 7.5 \times 10^{-2}$ m.
Mass for which depression is found = 45×10^{-3} kg.

To determine breadth 'b': (using slide callipers).

Least count of slide callipers. =

$$LC = \frac{\text{Values of 1 MSD.}}{\text{Total no of Vernier Scale division.}} =$$

LC = 0.01 cms.

Trial No.	M.S.R	C.V.S.D.	Breadth b in cms. b=MSR+(CVSDxLC)
1. 1.1	1.1	5	1.15
2. 1.1	1.1	5	1.15
3. 1.1	1.1	5	1.15
4. 1.1	1.1	5	1.15

in single cantilever should be range of 15 to 20

To determine thickness 'd': Using screw gauge

$$\text{Pitch} = \frac{\text{distance moved on pitch scale.}}{\text{No of rotations given to head scale.}} = 1\text{m}$$

$$LC = \frac{\text{Pitch.}}{\text{No of divisions on head scale}} = 0.01\text{mm}.$$

Zero error = +7 divisions Zero correction = −7 div.

	PSR	HSR	Corrected HSR	Thickness mm. d=PSR+(HSRxLC)
	0	62	55	0.55
	0	62	55	0.55
	0	62	55	0.55
	0	62	55	0.55.

Name of Experiment.. Date...

Experiment No.. Experiment Result..

Page No.

mean depression for 45gms is calculated.

The length of the cantilever from the point projection to the point where scalepan is hung is measured using meter scale. Breadth 'b' and thickness 'd' of the bar is measured using slide calliper and screw gauge. The young's modulus of the bar is calculated using $q = \frac{4mgl^3}{bd^3s}$.

RESULT

Young's modulus of the given material is $= 15.15 \times 10^{10}\, N/m^2$

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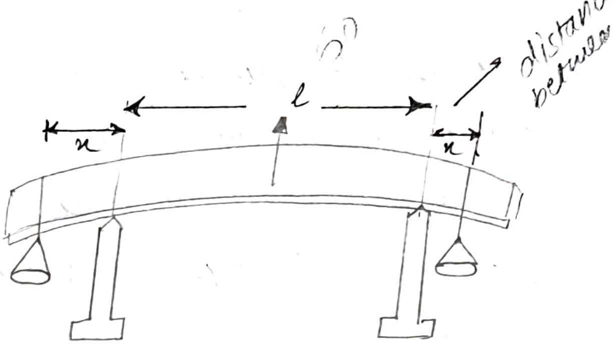
FIGURE:



$\frac{3Mgl^2x}{2bd^3\delta}$

OBSERVATIONS

3 mo

$\frac{3mgl^2x}{2bd^3\delta}$

Least count of the travelling microscope:

L.C = $\frac{\text{Value of 1 MSD}}{\text{Total number of VSD}}$ = 0.001 cms.

Load in gms.	TM Readings in cms. Load decreasing	Load decreasing	Mean R_1	Load in grams	TM Readings in cms. Load increasing	Load decreasing	Mean R_2	Elevation 'δ' for 60 gms in cms $\delta(R_1-R_2)$
15	5.785	5.790.	5.785	60	5.816	5.815	5.830	0.045
30	5.765	5.765	5.765	75	5.895	5.896	5.895	0.130
45	5.800	5.799	5.799	90.	5.889	5.889.	5.899	0.100.

Mean elevation(δ)
= 0.091 x cms
= 0.091×10^{-2} m.

$\times10^{-2}$

Distance between the knife edges
$l = 60\times10^{-2}$ m.

Distance between weight and the nearer knife edge
$l = 10\times10^{-2}$ m.

Mass for which elevation is found = 45×10^{-3} kg.

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Experiment No. 4 .... Experiment Result..

YOUNG'S MODULUS BY UNIFORMING BENDING.

AIM:-

To determine the Young's modulus of the material by uniforming bending method.

APPARATUS:-

A uniform wooden bar about 1 meter long, two knife edges two weight hangers, travelling microscope, slide calipers, screw gauge.

FORMULA:-

The Young's modulus of material of the bar is given by.

$$q = \frac{3mgl^2x}{2bd^3\delta} \; N/m^2.$$

m = Mass of which the elevation is found.

g = Acceleration due to gravity = $9.8 m/s^2$

x = Distance between weight hanger and nearer knife edge

b = breadth of the bar, m.

d = thickness of the bar, m.

δ = Mean elevation for the load of m kg, m.

PROCEDURE:

The given wooden bar (meter scale) is placed symmetrically on 2 knife edges such that about one-fourth of the bar projects beyond each knife edges. Two scale pans are suspended at each

To determine breadth "b" using side callipers.

Least count of slide calliper.

$$L.C = \frac{\text{Value of 1 M.S.D}}{\text{Total number of vernier scale division}}$$

LC = 0.01 cms.

Trial No.	M.S.R	C.V.S.D	Breadth 'b' in cms. b = MSR + (CVSD X LC)
1	2.8	1	28 + (1 x 0.01) = 2.81
2	2.8	1	28 + (1 x 0.01) = 2.81
3	2.8	1	28 + (1 x 0.01) = 2.81
4	2.8	1	28 + (1 x 0.01) = 2.81

2.81×10^{-2} mts.

To determine the thickness 'd' : (using screw gauge).

$$L.C = \frac{\text{Pitch}}{\text{No of divisions on head scale}} = 0.01 \text{ mm}.$$

Trial NO	PSR	HSR	Corrected HSR	Thickness of the mm.
1	4	35	35	4.35
2	4	35	35	4.35
3	4	35	35	4.35
4	4	35	35	4.35.

Mean thickness = 4.35×10^{-3} m.

CALCULATION.

$$\frac{4 \times 45 \times 10^{-3} \times 9.8 \times (60 \times 10^{-2}) \times 10 \times 10^{-2}}{2 \times 2.81 \times 10^{-2} \times (4.35 \times 10^{-3})^3 \times 0.24 \times 10^{2}} = 0.750 \times 10^{10} \text{ N/m}^2$$

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Experiment No.................... Experiment Result....................

end of the scale such that the distance from the knife edges are equal. A pin fixed vertically at the centre of the scale by means of wax. A load of 15 grams is added to each of the scale pan. A travelling microscope is focused on the tip of the pin such that a clear image is seen. The microscope is adjusted such that the image of the tip of the pin coincides with the point of intersection of the cross wires and the readings is taken. The load in each of the scalepan is increased in steps of 20 grams till a maximum load of 90 gms are readings are taken. Then the same experiment is repeated by take the loads in a decreasing manner.

The distance between the knife edges 'l' and the distance between the weight hanger and the nearest knife 'edges' 'x' is measured using a meter scale. The breadth 'b' and thickness 'd' of the bar are measured using a slide callipers and screw gauge respectively. The young's modulus

$$q = \frac{3mgl^2x}{2bd^3S}.$$

RESULT: The young's modulus of the material of given bar = 0.750×10^{10} N/m^2.

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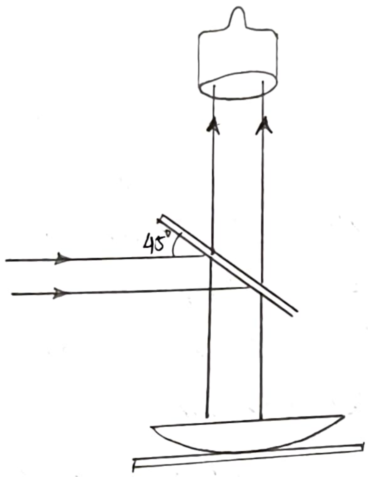
DIAGRAM:



OBSERVATIONS:

Ring No.	Tm Readings.		Diameter D_m^2 in mm	D_m^2 in mm^2	Ring No "n"	Tm Readings in mm.		Diameter D_n in mm	D_n^2 in mm^2	$D_m^2 - D_n^2$ in mm^2
	Left L_m	Right R_m	$D_m = L_m - R_m$			Left L_n	Right R_n	$D_n = L_n - R_n$		
8	10.959	10.651	0.308.	0.0940	4	10.91	10.720	0.190	0.0361	0.0579
7	10.994	10.655	0.339	0.1140	3	10.905	10.740	0.165	0.0270	0.0870
6	10.940	10.657	0.283	0.0800	2	10.925	10.756	0.169	0.0280	0.0520
5	10.978	10.667	0.311	0.0960	1	10.860	10.840	0.020.	0.004	0.0956.

Mean $(D_m^2 - D_n^2) =$ mm^2

$= 0.0731 \times 10^{-6} m^2$

CALCULATIONS

$$\frac{0.0731 \times 10^{-6}}{4 \times 4 \times 5893 \times 10^{-10}} = 0.77 \text{ mts.}$$

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Experiment No.....8... Experiment Result..

NEWTON'S RING

AIM:-

To determine the radius curvature of a plano-convex lens by Newton's ring method.

APPARATUS:-

Newton's ring apparatus, travelling microscope, sodium vapour lamp given by.

$$R = \frac{D_m^2 - D_n^2}{4(m-n)\lambda} \ m \qquad \frac{D_m^2 - D_n^2}{4(m-n)\lambda}$$

Where D_m = diameter of the m^{th} dark ring, m.

D_n = Diameter of the n^{th} dark ring m.

$(m-n)$ = Difference between the m^{th} and n^{th} dark ring.

λ = Wavelength of sodium light $= 5893 \times 10^{10}$ m.

PROCEDURE:

The apparatus is set up as shown in the figure. The travelling microscope is placed such that the objective is directly above the plano-convex lens. The inclined glass plate is tilted so that the light rays from the sodium vapour lamp is reflected on the glass plate. and field is illuminate.

The travelling microscope is adjusted such that the cross wire is first moved towards left such that the vertical cross wire is tangential to 8^{th} dark ring and reading of microscope is taken. Every reading is noted down till 8 th dark reading on the other side is reached. The readings are entered. and mean value is calculated.

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The readings are entered in the tabular column and value of $(D_m^2 - D_n^2)$ is calculated. Knowing the wavelength of sodium light, the radius of curvature of the plano-convex lens is calculated using the formula.

$$R = \frac{D_m^2 - D_n^2}{4(m-n)\lambda}.$$

RESULT:

The radius of curvature of the given plano-convex lens is

= 0.77 m

radius of curvature m

0.7 — 1.0.

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DEPARTMENT OF PHYSICS

Valued