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| Full name:  Student ID:  Class:  Group: | Verification of the instructors   |  |  | | --- | --- | |  |  | |

EXPERIMENT 5: MOMENT OF INEPTIA ON TORSIONAL

VIBRATION

1. Purpose of the experiment

- Verifying the linear relationship between and

- Understanding about the moment of inertia, torsion modulus…

- Showing the torsion modulus D and its uncertainty.

- Showing the moment of inertia of the long rod.

2, Theoretical background

- Period of vibration: T=

-: Torsion modulus :

-Relationship:

3, Experiment procedure

a) Set up

- Instruments:

+ Torsion apparatus watch

+ Torsion rod (steel)

+ Spring balance

+ Stop watch

+ Sliding weight

+ Support rods and base

-The experimental set-up is arranged as the sketched figure on the right.

b) Perform the experiment

- Assemble the steel rod on the torsion apparatus.

- Use the spring balance of force to turn the disk around. The force applied is being deplected at an angle

- Record the value of force F shown on the spring balance at various distance from the level arm.

- Pull out to turm the disk being deflected an angle , then let it vibrate. Use the stop watch to determine the vibration period.

-Repeat the following steps with various deplected angle

I. EXPERIMENTAL RESULT

1. Measurement of force (F) with r = 0,15 (m)

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | 1=10o | | ᵠ2=15o | | ᵠ3=20o | | ᵠ4=25o | | ᵠ5=30o | |
| Trial | r (m) | F (N) | r (m) | F (N) | r (m) | F (N) | r (m) | F(N) | r (m) | F(N) |
| 1 | 0.15 | 0.85 | 0.15 | 1.10 | 0.15 | 1.40 | 0.15 | 1.70 | 0.15 | 1.95 |
| 2 | 0.15 | 0.85 | 0.15 | 1.05 | 0.15 | 1.45 | 0.15 | 1.75 | 0.15 | 1.90 |
| 3 | 0.15 | 0.80 | 0.15 | 1.10 | 0.15 | 1.45 | 0.15 | 1.70 | 0.15 | 1.95 |
| 4 | 0.15 | 0.80 | 0.15 | 1.10 | 0.15 | 1.45 | 0.15 | 1.75 | 0.15 | 1.90 |
| 5 | 0.15 | 0.85 | 0.15 | 1.05 | 0.15 | 1.40 | 0.15 | 1.70 | 0.15 | 1.90 |
| Av | 0.15 | 0.83 | 0.15 | 1.08 | 0.15 | 1.43 | 0.15 | 1.72 | 0.15 | 1.92 |

2. Measurement of vibration period T(s) with r = 0,15 (m)

|  |  |  |  |
| --- | --- | --- | --- |
|  | ᵠ1=10o | ᵠ2=20o | ᵠ3=30o |
| Trial | T1(s) | T2(s) | T3(s) |
| 1 | 1.307 | 1.162 | 1.171 |
| 2 | 1.417 | 1.146 | 1.173 |
| 3 | 1.411 | 1.122 | 1.179 |
| 4 | 1.359 | 1.128 | 1.157 |
| 5 | 1.414 | 1.126 | 1.155 |
| Av | 1.382 | 1.137 | 1.167 |

�=�2

II. DATA PROCESSING

1. Measurement of force (F)

Hence:

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|  |

Hence:

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|  |

Hence:

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|  |

Hence:

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|  |

Hence:

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* Graph showing the relationship of torsion on deflection angle
* Determination of the torsion modulus Dτ based on the graph

Using the above graph, we can see that the “best fit” line passes through the points (10; 0.018) and (20; 0.093)

Similarly, we see on the two blurred line, we can estimate the and

Hence:

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|  |

Calculation of the moment of inertia of the long rod

We have:

Hence:

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|  |

III. CONCLUSION

Bars made of different materials will undergo torsional vibration excitation. The derivation of the relationship between torsion and deflection, as well as the torsional period and moment of inertia, will be conducted.