



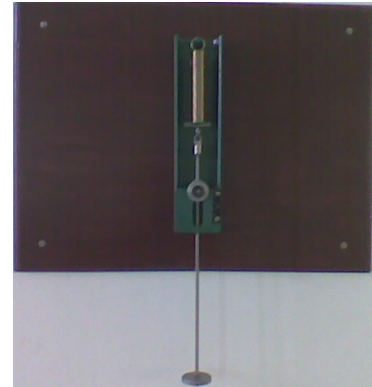
EXPERIMENT NO. 2

Objective:

To measure the stiffness of an Extension spring and compare it with the theoretical values.

Apparatus:

Extension of spring apparatus, Hangers and Weights,



Summary of Theory:

- Springs
- Types of Extension springs
- Derivation of formula (Castigliano's theorem)

Procedure:

Measure the diameter of wire and outer dia of spring with the help of vernier caliper. Fit the compression spring in the spring support. To fit compression spring, remove the load hanger base by unscrewing the grip knob and base from the rod thread. Loosen or remove the grip knob on the marker and pull the load hanger down until the top can be swung out from the slop by the 50 mm scale. Withdraw the rod upward, insert the new spring and reverse the above procedure to return the apparatus to full working condition.

Load the spring by 5N increments recording the change in length of the spring up to the greatest readable deflection or the max load of 55N. Record the spring dimensions Repeat the same process for other springs and record the readings.

Load-Extension Curve:

Observations & Calculations:

	<u>Spring Data</u>	
Wire diameter	=	_____ (mm)
Spring O/D	=	_____ (mm)
Spring Length	=	_____ (mm)
Number of active turns	=	_____
Modulus of rigidity	=	_____ (N/ mm ²)

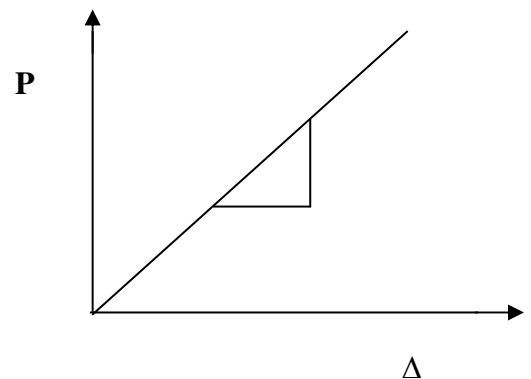


Figure (1)



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$$\text{Stiffness} = W / \Delta = d^4 G / 8N D^3$$

Where d = Wire diameter

N = Number of turns

D = mean diameter of spring coil (O/D – d)

G = Modulus of rigidity (77 KN/ mm² for spring steels)

No. of Obs.	Load (W) N	Deflection (Δ) mm			Slope from Graph (N/mm)	Theoretical Value = $d^4 G / 8N D^3$ (N/mm) (Mean Value)	%age Error
		Loading	Unloading	Mean			
1							
2							
3							
4							
5							
6							

Name: _____

Reg. # _____

Date:

Report:

The laboratory report should contain the following:

1. Plot of curve between Load **P** and Extension Δ as shown in figure (1).
Calculate the slope of the graph.
2. Derivation of the formula.
3. Hand calculations showing all results under procedure above.
4. A discussion / comments of factors affecting the results of the experiment.
5. Practical Applications