

**THE UNIVERSITY OF ZAMBIA
SCHOOL OF ENGINEERING
DEPARTMENT OF MECHANICAL ENGINEERING**

**EE392 ELECTRICAL ENGINEERING PRACTICE – MECHANICAL COMPONENT LABORATORY
LAB. INSTRUCTION SHEET No.:2**

1.0 Title

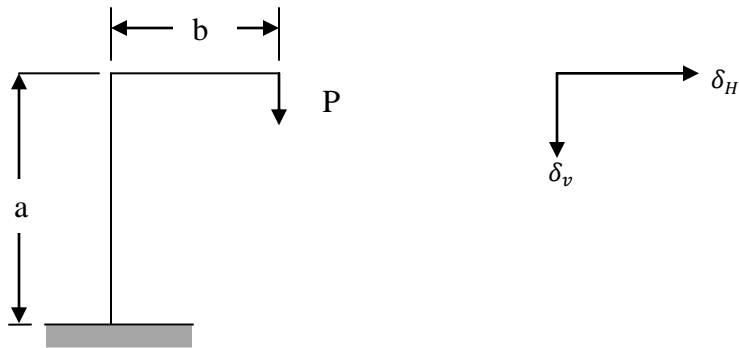
BENT CANTILEVER EXPERIMENT

2.0 Objective

To illustrate the application of Castigliano's Theorem in the determination of beam deflection.

3.0 Theory

For more detailed treatment of the theory, consult standard textbooks on Strength of Materials



For the bent cantilever, verify that:

$$\delta_H = \frac{Pa^2b}{2EI} \quad \text{and} \quad \delta_v = \frac{Pb^2(3a+b)}{3EI}$$

4.0 Equipment/Apparatus

Students are required to describe the equipment used in the experiment

5.0 Procedure

- Clamp the cantilever in a given position and record a set of readings of load, P, and deflection (vertical, and horizontal,). Ensure the curved end of the beam is always making tangential contact with flat faces of the dial gauges. Further ensure that the maximum load P does not exceed 3.5 kg, especially at the tip of the horizontal part of the beam.
Repeat the readings for four or five different values of "b" ranging from, say 50 to 250mm
- Plot δ_H and δ_v against P for each setting and obtain the slopes and
- Plot $\frac{\delta_H}{P}$ against a^2b and $\frac{\delta_v}{P}$ against $b^2(3a+b)$ and obtain three values of EI
- Measure the section and calculate the average experiment value of E.

6.0 Results/Points of Discussion

- Discuss on your results.
- What would be the effect of imperfect clamping at the root of the cantilever