Student Designed Experiment - S3G4

Beam Bending Of Composite Materials

Objectives

- To experimentally study the linear elastic behaviour of composite beams under four point bending.
- To compare bending of equivalent beam using transformed area method
- Compare experimental Young's Modulus obtained from deflections of beam and theoretical Young's Modulus from documented sources.

Experimental Plan

1. The centre of the composite beam is marked and 2 points equidistant from the centre are marked at the right and left using vernier callipers, and strain gauges are mounted at the top and bottom surfaces
2. The beam is simply supported and loaded at the centre using 4-point loading.
3. Strain gauge readings will be taken for varying loads during loading and unloading.
4. The experimental readings are compared with the theoretically obtained (Euler Bernoulli theory) values of deflection. (Young's modulus of the beams can be found using compressive testing, using UTM in the first place or using documented sources.)

Analysis

Transformed section method allows us to transform the cross section of a composite beam into an equivalent cross section of an imaginary beam composed of only one material.To transform the beam into material 1,The dimensions of area 1 remain unchanged, and the width of area 2 is multiplied by n(dimensions perpendicular to the neutral axis remain the same)
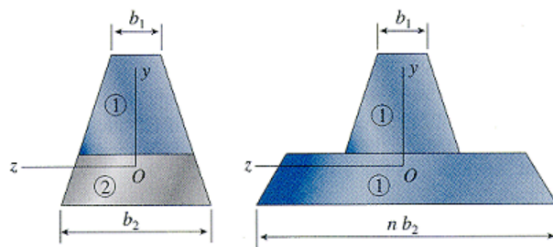
$$n = \frac{E_2}{E_1}$$

Expected Results:

We expect the graphs of deflection of the two beams(Composite and Equivalent Single Material) to match closely as we have replaced one material with it's equivalent by changing Young's Modulus and Area in a way that the deflection of beam be balanced.