Lab 5 Beam Deflection and Analysis

Section 11 Group 4 Date: Month/Date/Year

Member: Peter Brown

Instructions:

- Replace the highlighted areas in yellow above with your own name, section and group numbers and correct dates,
- Watch the corresponding lab demo videos, review related materials in lecture notes, lab manual and other related documents,
- Provide your best answers to the following questions. Add pages as needed,
- Convert this Word answer sheet into pdf format and submit to Canvas.

Apply the basic beam theory, which you learned in EM324 or the like, to directly solve for the deflections for the cantilever beam setup as shown in Fig. 1. Please note that, in the following references, "x grams load" or simply "x grams" should be interpreted as the "gravitational weight/force of x grams mass". Here the quantity of x purely measures the mass itself.

1. (30 pts) Derive a general formula by using either method of superposition or discontinuity function method and show the following expression for deflections at 1/3 beam length measured from the free end, i.e.

$$x=\frac{2}{3}L,\ y=\frac{-w}{EI}\frac{14}{81}L^3$$

2. (20 pts) Calculate the deflections in mm at 1/3 beam length measured from the free end for three beams of rectangular cross section subjected to loads at the free end. Let the beam length be 90cm and use E = 68.9 GPa (for Aluminum 6061-T6511 alloy). The beam cross sections and loads are as follows:

   (A) 12.8 x 6.4 mm (12.8 mm is the base and 6.4 mm is the height) rectangular cross-section with 100 grams load.
   (B) 6.4 x 12.8 mm rectangular cross-section with 200 grams load.
   (C) 12.8 x 12.8 mm square cross-section with 500 grams loads.

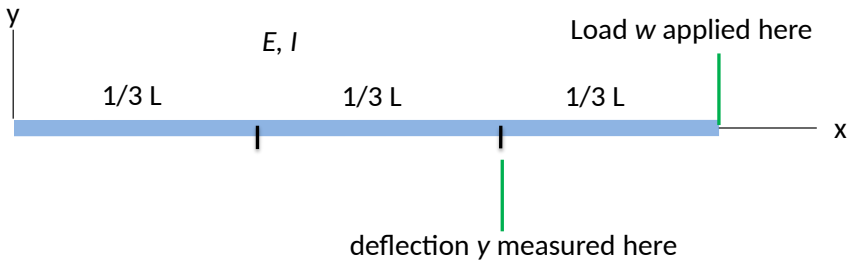

Figure 1. Cantilever beam setup for Prelab

Lab 5 Beam Deflection and Analysis

Section 11 Group 4 Date: Month/Date/Year

Member: Peter Brown

Total 50 points

Answers: