PHY102 : Waves and Matter

Assignment - 7

Optional. You do not have to submit it.
You are encouraged to try out all the problems.

1. Determine the maximum deflection δ_{max} in a beam of length L whose one end is fixed. It carries load P at the other end of the beam.

2. Determine the maximum deflection δ in a beam of length L carrying a concentrated load P at mid-point of the beam.

3. Determine the deflection $y(x)$ and maximum deflection δ in a supported beam of length L carrying a uniformly distributed load w applied over its entire length.

4. Find the maximum deflection for a beam of length L fixed at one end and free at the other. In this, a load W is concentrated at a distance a from the fixed end of the beam.

5. A simply supported beam shown in the figure below carries a uniform load of w_0 per unit length symmetrically distributed over part of its length. Determine the deflection δ as a function of x.

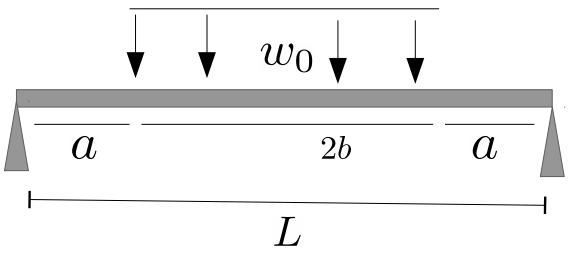

Figure 1:

6. Try other problems given in the lecture notes of Dr. Bhas Bapat (pages 61 to 71).

5. A rope-walker walks on a steel rope tied between two walls. While walking, she creates a tension of 3.94×10^3 N. The wire makes an angle of 5^o with below with the horizontal with each supporting wall. Calculate how much this tension stretches the steel wire if it was originally 15 m long and 0.50 cm in diameter.

6. The volume of a steel sphere is found to decrease by 0.l04% when it is placed at a depth d in the ocean. If the pressure at the ocean surface is taken to be 101.3 kPa, then what is the pressure at depth d ? Bulk modulus of steel is $158 \times 10^9 Pa$.

7. A long rod is created by welding together two rods that have the same diameter. The rods are made of different material with Young's moduli Y_1 and Y_2 and their lengths are l_1 and l_2. Assume $l_1 > l_2$. Find the Young's modulus of the welded rod.

8. Consider a steel cube and a force of $5 \times 10^6 N$ is applied tangentially (shear force) on one face of the cube. The angle of shear is about 0.65^o. Find the volume of the original cube.

NOTE 1 : Some more problems of this type are also available at this web link. Try them as well.

NOTE 2 : Visit this website for some additional notes on bending and buckling of beams.