1. Find the deflection of the neutral axis of the beam shown in figure 1. Take the bending modulus EI to be constant. Find the deflection in terms of x, where x is the distance from the fixed end of the beam.

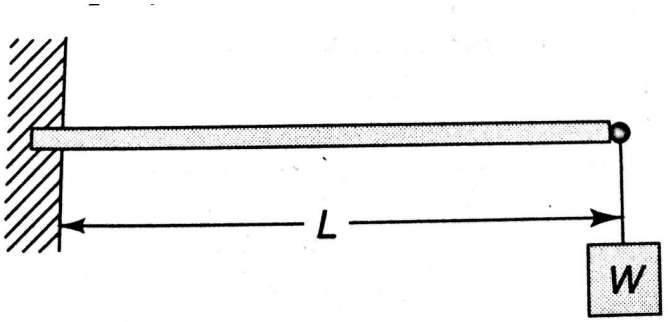

Figure 1

$$y = \frac{P}{6EI}(x^3 - 3Lx^2)$$

2. In figure 1 estimate the deflection at the center of the beam.

$$y = \frac{5PL^3}{48EI}$$

3. Find the deflection of the neutral axis of the beam shown in figure 2. Take the bending modulus EI to be constant.

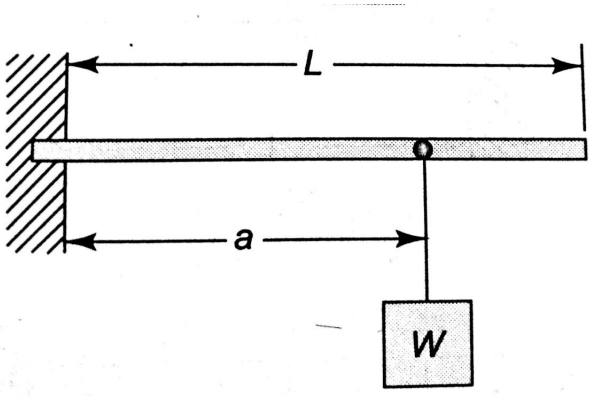

Figure 2

$$y = \frac{P}{6EI}(x^3 - 3ax^2 - (x-a)^3)$$

4. Find the deflection of the neutral axis of the beam shown in figure 3. Take the bending modulus EI to be constant.

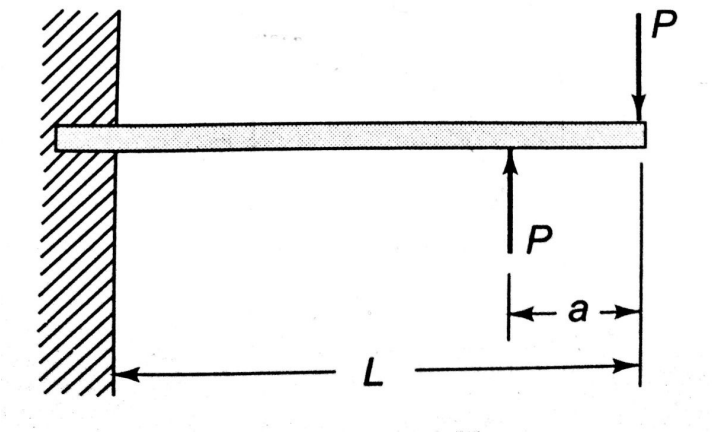

Figure 3

$$y = \frac{P}{6EI}(-3ax^2 - (x-L+a)^3)$$

5. Find the deflection of the neutral axis of the beam shown in figure 4. Take the bending modulus EI to be constant.

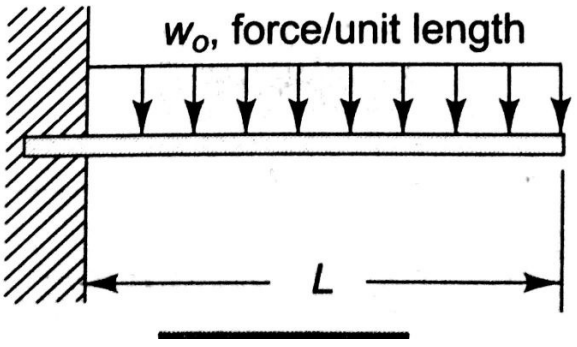

Figure 4

$$y = \frac{w_0}{6EI}(4Lx^3 - 6L^2x^2 - x^4)$$

6. In figure 4 estimate the deflection at the center of the beam.

$$y = \frac{17w_0L^4}{384EI}$$

7. A uniform beam is fixed at both ends as shown in figure 5. Find the maximum bending moment due to a uniformly distributed load of intensity w per unit length.

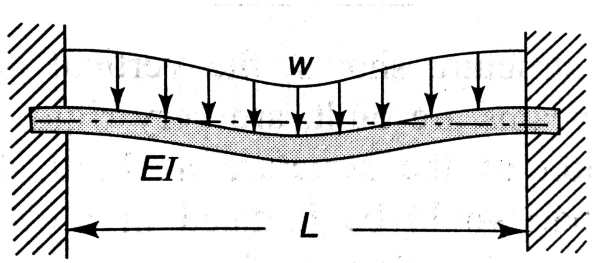

Figure 5

$$M_{max} = \frac{w_0L^2}{12}$$

8. In figure 5, find the maximum deflection.

$$y = \frac{w_0L^4}{384EI}$$

9. A simply supported beam carries a uniformly distributed loading of 15 kN/m. In order to avoid possible cracking of the plaster on the ceiling beneath the beam, it is desired that the deflection should not exceed 1/360 of the span length L. If L = 3.6 m and E = 7 GPa,

   Estimate the bending moment and shear force at L/4 from the hinged end

- **18.225 kNm, 13.5 kN**
- 28.225 kNm
- 38.225 kNm
- 48.225 kNm

10. What is the minimum allowable value of the section moment of inertia I?

- 2.68 x 10^{-4} m^4
- 3.68 x 10^{-4} m^4
- **4.68 x 10^{-4} m^4**
- 5.68 x 10^{-4} m^4

11. If the cross section of the beam is rectangular and the depth is 3 times the width of the beam. Estimate the width of the beam.

- 420 mm
- 320 mm
- 220 mm
- **120 mm**