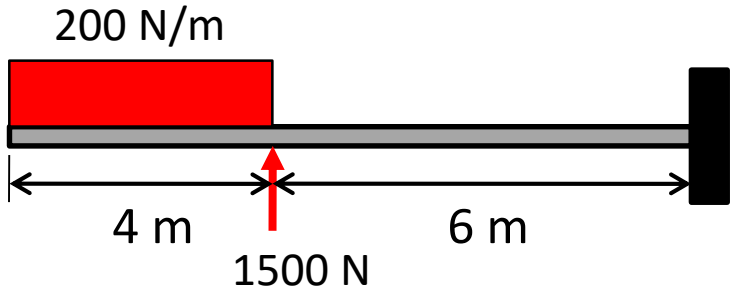
Module - 3 Mechanics of Materials

- Beams

  shear and bending moments, normal and shear stress, transverse deflection

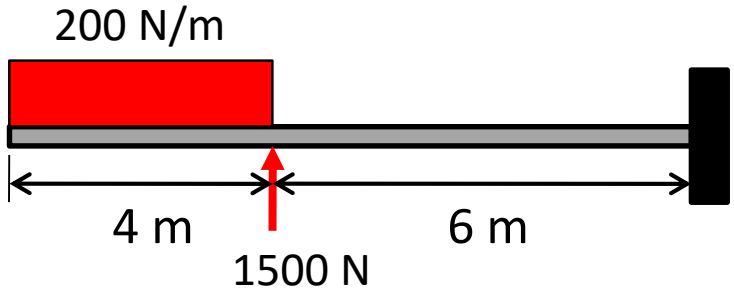
Problem 16 – Max Shear Force



A cantilever beam built in at its right end is subjected to the loading as shown in the figure. Determine the maximum internal shear force experienced by the beam.

(A) 200N (B) 700N (C) 800N (D) 1500N

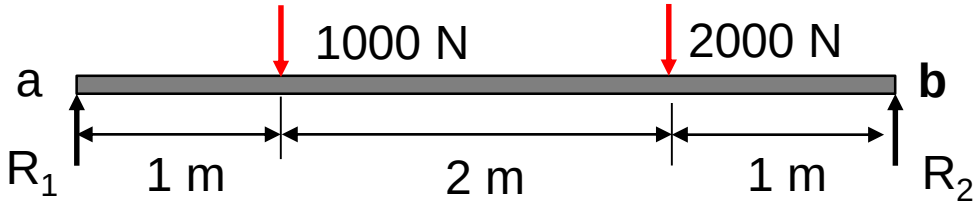
Problem 17 – Bending Moment



For the same beam as shown in Problem 18 determine the maximum internal bending moment.

(A) 1600 Nm (B) 2100 Nm
(C) 2600 Nm (D) 3100 Nm

Alternative V and M Solution Method



Determine reactions $(R_1 \& R_2)$

$$\sum M_b = 0 \qquad (R_1 \times 4) - (1000 \times 3) - (2000 \times 1) = 0$$

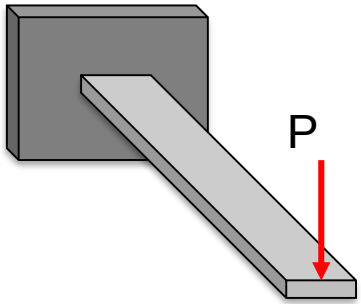
$$R_1 = \frac{3{,}000 + 2{,}000}{4} = 1250 \text{ N}$$

$$\sum F_v = 0$$

$$R_1 + R_2 - 1000 - 2000 = 0$$

$$R_2 = 3000 - 1250 = 1750 \text{ N}$$

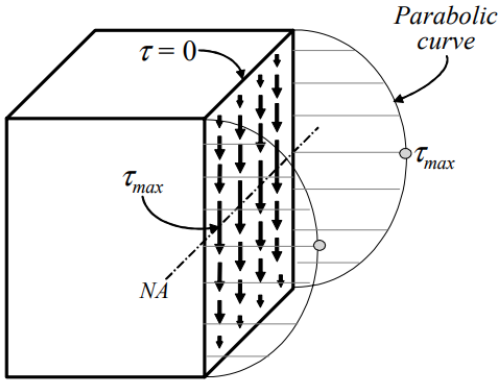
Problem 18 – Bending Stress



The cantilevered leaf spring shown on the left is deflected 6 mm by the force P applied at its end. Determine the maximum bending stress created by this loading. The dimensions of the spring are: width = 25 mm, thickness = 6 mm, length = 400 mm. E = 200 GPa

(A) 78 MPa (B) 83 MPA (C) 88 MPa (D) 93 MPa

Problem 19 – Transverse Shear Stress

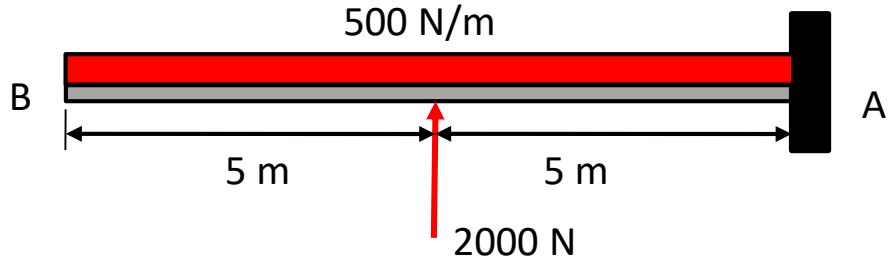


Shear Stress distribution

The transverse shear stress distribution in a loaded beam of rectangular cross section (b x h) is parabolic with the maximum value occurring at the neutral axis. Determine the magnitude of this maximum stress for a cross section whose average shear stress is 200 Pa.

(A) 250 MPa (B) 300 MPA (C) 350 MPa (D) 400 MPa

Problem – 20 Beam Deflection



Determine the deflection at the free end (B) of the cantilever beam shown in the figure. The moment of inertia, I, of the cross section is 15,000 cm^4 and the modulus E is 207 GPa.

(A) 0.134 cm (B) 0.268 cm (C) 1.34 cm (D) 2.68 cm

Thanks for watching

and

on the exam !