

Problem 6-76

The bolster or main supporting girder of a truck body is subjected to the uniform distributed load. Determine the bending stress at points *A* and *B*.

Given: $L_1 := 2.4\text{ m}$ $L_2 := 3.6\text{ m}$
 $b := 150\text{ mm}$ $t_f := 20\text{ mm}$
 $d := 300\text{ mm}$ $t_w := 12\text{ mm}$
 $w := 25 \frac{\text{kN}}{\text{m}}$

Solution:

By symmetry: $F_1 = R$ $F_2 = R$

Equilibrium:

$$+\uparrow \Sigma F_y = 0; \quad -w \cdot (L_1 + L_2) + 2R = 0$$

$$R := 0.5 \cdot w \cdot (L_1 + L_2)$$

$$\curvearrowleft M_{AB} := R \cdot L_1 - 0.5w \cdot L_1^2$$

Section properties: $D := d + 2 \cdot t_f$

$$I := \frac{1}{12} \cdot [b \cdot D^3 - (b - t_w) \cdot d^3]$$

Bending Stress: $\sigma = M \cdot \frac{c}{I}$

$$c_B := \frac{d}{2} \quad \sigma_B := M_{AB} \cdot \frac{c_B}{I}$$

$\sigma_B = 89.6 \text{ MPa}$ **Ans**

$$c_A := \frac{d}{2} - t_f \quad \sigma_A := M_{AB} \cdot \frac{c_A}{I}$$

$\sigma_A = 77.65 \text{ MPa}$ **Ans**

