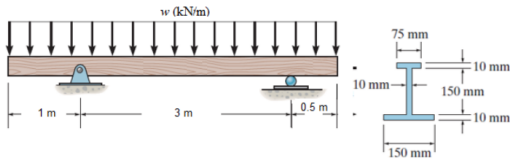


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Question: The beam with cross-section shown carries a uniformly distrib...


The beam with cross-section shown carries a uniformly distributed load of intensity w over its entire length. Determine w if $f_{dt} \leq 40$ MPa and $f_{dc} \leq 80$ MPa. (



Hello guys, can you show complete solution for this problem. Thank you

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Expert Answer

 **Anonymous** answered this
564 answers

Was this answer helpful?

Below is the complete solution. Taking clockwise moment as positive and anti-clockwise moment as negative.

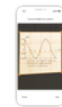
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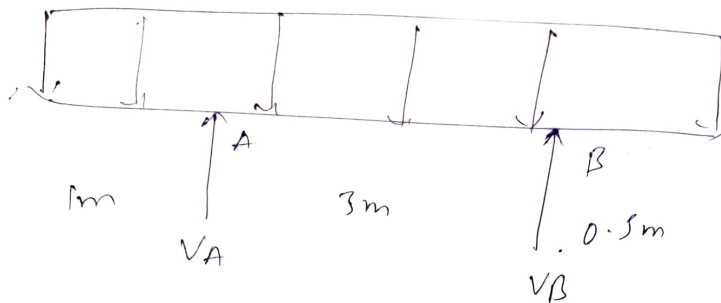


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$$\sum M_A = 0$$

$$- V_B \times 3 + w \times 3.5 \times \frac{3.5}{2} - w \times 1 \times \frac{1}{2} = 0$$

$$- 3V_B + 6.125w - 0.5w = 0$$

$$V_B = \frac{5.625w}{3}$$

$$V_B = 1.875w$$

$$\sum F_y = 0$$

$$V_A + V_B = w \times (4.5)$$

$$V_A = 2.625w$$

BM maximum can occur at

A or B or Between A & B.

$$(BM)_A = -w \times 1 \times \frac{1}{2} = -\frac{w}{2}$$

(BM) between A & B where shear force is zero

Location of zero shear force

$$V_A - w \times (1+x) = 0$$

$$\therefore 1+x = \dots$$



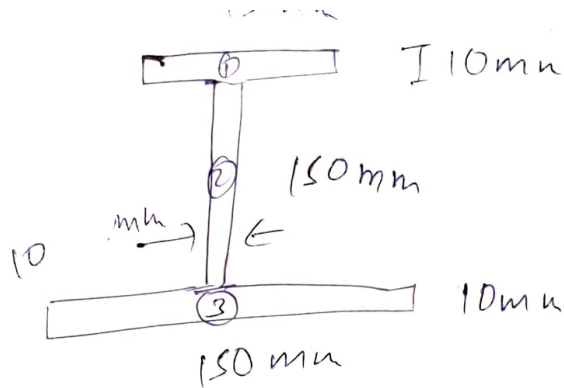
$$x = 1.625$$

$$\begin{aligned}
 (Bm)_{x=1.625} &= V_A \times 1.625 - w \times \left(\frac{1+1.625}{2} \right) \left(\frac{1+1.625}{2} \right) \\
 &= 2.625w \times 1.625 - \frac{2.625 \times 2.625 w}{2}
 \end{aligned}$$

$$(Bm)_{x=1.625} = 0.82w$$

$$(\text{Max}) \text{ bending moment} = 0.82w$$

It is positive so sagging moment will occur + bottom tension + Top compression.



$$A_1 = 75 \times 10 = 750 \text{ mm}^2$$

$$Y_1 = 10 + 150 + \frac{10}{2} = 165 \text{ mm}$$

$$A_2 = 150 \times 10 = 1500 \text{ mm}^2$$

$$Y_2 = 10 + \frac{150}{2} = 85 \text{ mm}$$

$$A_3 = 150 \times 10 = 1500 \text{ mm}^2$$

$$Y_3 = \frac{10}{2} = 5$$

$$\bar{Y} = \frac{A_1 Y_1 + A_2 Y_2 + A_3 Y_3}{A_1 + A_2 + A_3}$$

$$= \frac{750 \times 165 + 1500 \times 85 + 1500 \times 5}{750 + 1500 + 1500}$$

$$= \frac{750 \times 165 + 1500 \times 85 + 1500 \times 5}{750 + 1500 + 1500}$$

$$\bar{Y} = 69 \text{ mm}$$



11

$$\begin{aligned}
 &= \frac{75 \times 10^3}{12} + 750(69-165)^2 + \frac{10 \times 150^3}{12} + 1500(69-85)^2 \\
 &\quad + \frac{150 \times 10^3}{12} + 1500(69-5)^2 \\
 &= 6918250 + 31965000 + 6156500 \\
 &= 16271250 \text{ mm}^2.
 \end{aligned}$$

$$\sigma_T = \frac{m\bar{y}}{I} = \frac{(0.82w) \times 69}{16271250}$$

$$\sigma_T = 40 \text{ MPa}$$

$$40 = \frac{0.82w \times 69}{16271250}$$

$$\boxed{w = 11.50 \text{ kN}}$$

$$\sigma_C = \frac{m(170-69)}{16271250}$$

$$\sigma_C = 80 \text{ MPa}$$

$$80 = \frac{(0.82w)(101)}{16271250} \Rightarrow \boxed{w = 15.72 \text{ kN}}$$

$$\boxed{w = 11.50 \text{ kN}}$$

$$w(\text{kN/m}) = \frac{11.50}{4.5} = 2.56 \text{ kN/m}$$

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Two vertical, parallel, clean, glass plates are spaced a distance of 2.3 mm apart. If the plates are placed in water how high will the water

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A fluid having a density of 1400 kg/m³ stands in a thin tube of 6mm diameter at a height of 27mm. What is the true static height? Use

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