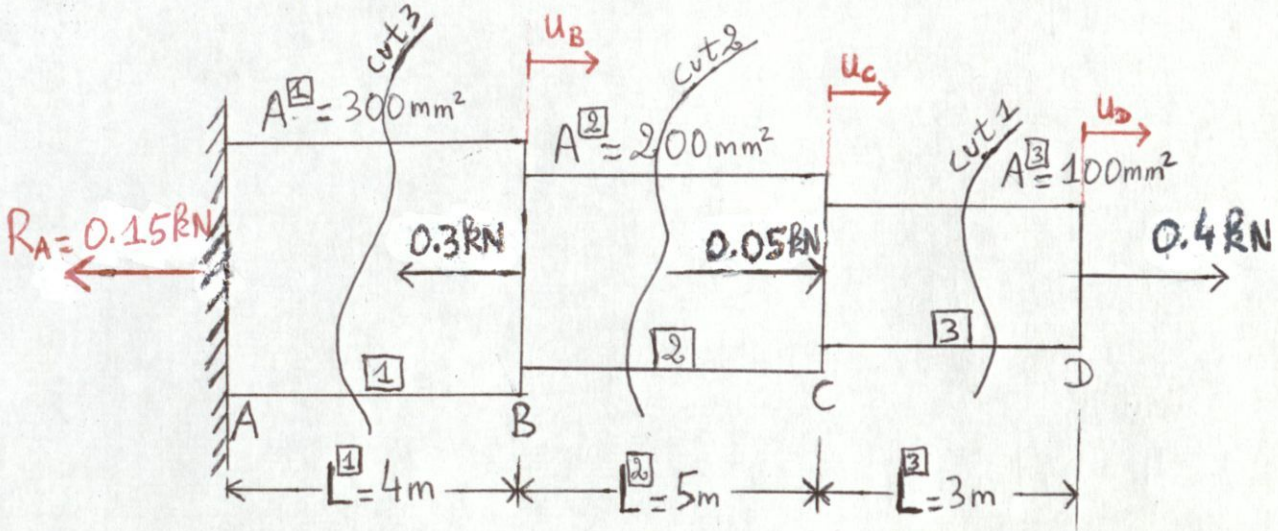
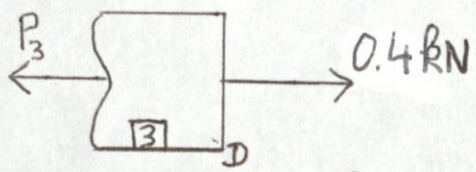
DTY Tutoring, inc.
Email: dtytutoring@gmail.com
Website:www.dtytutoring.com

Date: 12th April 2019



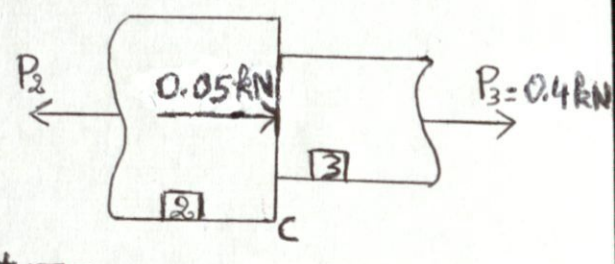
$\pm\rightarrow \sum F_x = 0$; $0.4 + 0.05 - 0.3kN + R_A = 0 \Rightarrow R_A = 0.15kN \leftarrow$

FBD Cut 1



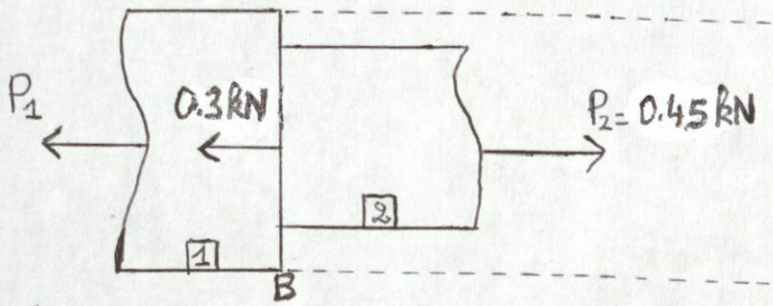
$\pm\rightarrow \sum F_x = 0$; $P_3 = 0.4kN$

FBD Cut 2



$\pm\rightarrow \sum F_x = 0$; $P_2 = 0.05 + 0.4 = 0.45kN$

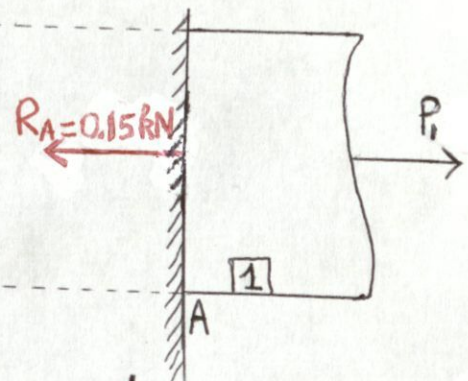
FBD Cut 3 (RHS) → Right Hand Side



$\pm\rightarrow \sum F_x = 0$; $P_1 + 0.3kN = P_2 = 0.45kN$

$P_1 = 0.45 - 0.3 = 0.15kN$

FBD Cut 3 (LHS) → Left Hand Side



$\pm\rightarrow \sum F_x = 0$; $P_1 = R_A = 0.15kN$ ✓

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(a) Stresses in each member

$$\sigma_{[1]} = \frac{P_1}{A^{[1]}} = \frac{0.15\,kN}{(300\,mm^2)\left(\frac{1\,m^2}{1\times10^6\,mm^2}\right)} = 500\,kPa = 0.5\,GPa$$

$$\sigma_{[2]} = \frac{P_2}{A^{[2]}} = \frac{0.45\,kN}{(200\,mm^2)\left(\frac{1\,m^2}{1\times10^6\,mm^2}\right)} = 2{,}250\,kPa = 2.25\,GPa$$

$$\sigma_{[3]} = \frac{P_3}{A^{[3]}} = \frac{0.4\,kN}{(100\,mm^2)\left(\frac{1\,m^2}{1\times10^6\,mm^2}\right)} = 4{,}000\,kPa = 4\,GPa$$

(b) displacements

$$e_1 = \frac{P_1 L_1}{A_1 E_1} = \frac{(0.15\,kN)(4\,m)}{(300\,mm^2)\left(\frac{1\,m^2}{1\times10^6\,mm^2}\right)(200{,}000\,kPa)} = 0.01\,m\left(\frac{1{,}000\,mm}{1\,m}\right) = 10\,mm$$

$$e_2 = \frac{P_2 L_2}{A_2 E_2} = \frac{(0.45\,kN)(5\,m)}{(200\,mm^2)\left(\frac{1\,m^2}{1\times10^6\,mm^2}\right)(200{,}000\,kPa)} = 0.05625\,m = 56.25\,mm$$

$$e_3 = \frac{P_3 L_3}{A_3 E_3} = \frac{(0.4\,kN)(3\,m)}{(100\,mm^2)\left(\frac{1\,m^2}{1\times10^6\,mm^2}\right)(200{,}000\,kPa)} = 0.06\,m = 60\,mm$$

$u_B = e_1 = 10\,mm$

$u_C = e_1 + e_2 = 10 + 56.25 = 66.25\,mm$

$u_D = e_1 + e_2 + e_3 = 10 + 56.25 + 60 = 126.25\,mm$