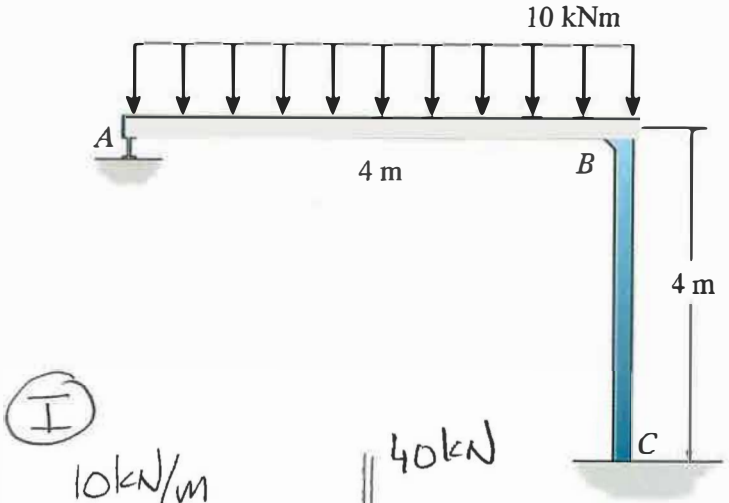
CIVL 4122 Quiz #2 F24

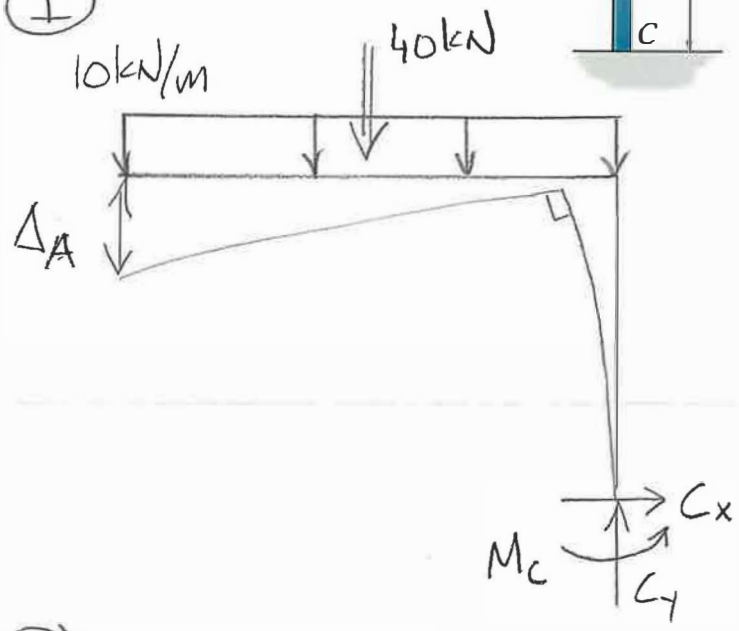
Name: _____

Determine the reactions at the reaction at the roller *A*. Support *C* is fixed.



$$\Delta_A + A_y f_{AA} = 0$$

(I)



$$\circlearrowleft + \sum M_C = 0 = M_C + 40\text{kN}(2\text{m})$$

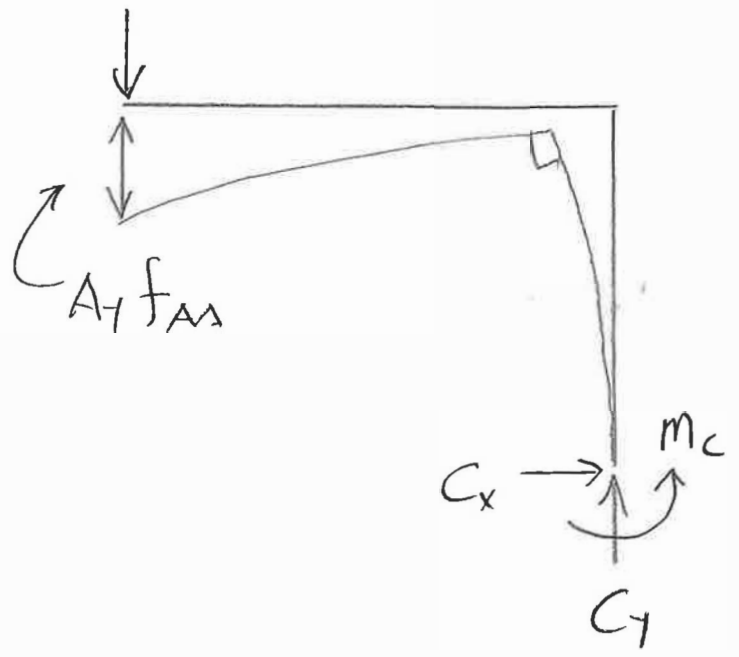
$$M_C = -80\text{kNm}$$

$$+\uparrow \sum F_y = 0 = C_y - 40\text{kN}$$

$$C_y = 40\text{kN}$$

$$\xrightarrow{+} \sum F_x = 0 = C_x$$

(II) $A_y = 1$



$$\circlearrowleft + \sum M_C = 0 = 1(4\text{m}) + m_C$$

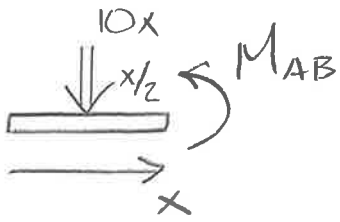
$$M_C = -4\text{m}$$

$$+\uparrow \sum F_y = 0 = C_y - 1$$

$$C_y = 1$$

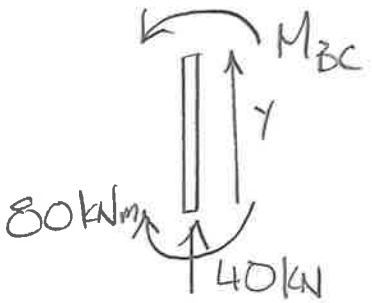
$$\xrightarrow{+} \sum F_x = 0 = C_x$$

(I) SECTION AB



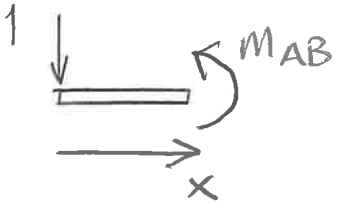
$\curvearrowleft \sum M_{CUT} = 0 = M_{AB} + 10x\left(\frac{x}{2}\right)$ $\underline{M_{AB} = -5x^2}$

SECTION BC



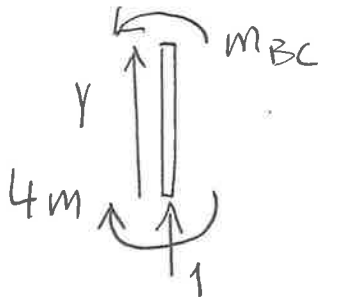
$\curvearrowleft \sum M_{CUT} = 0 = M_{BC} - 80\,kNm$ $\underline{M_{BC} = 80\,kNm}$

(II) SECTION AB



$\curvearrowleft \sum M_{CUT} = 0 = m_{AB} + 1x$ $\underline{m_{AB} = -x}$

SECTION BC



$\curvearrowleft \sum M_{CUT} = 0 = m_{BC} - 4m$ $\underline{m_{BC} = 4m}$

$$EI\Delta_A = \int_0^4 (-5x^2)(-x)\,dx + \int_0^4 (80)(4)\,dy = \int_0^4 -5x^3\,dx + \int_0^4 320\,dy$$

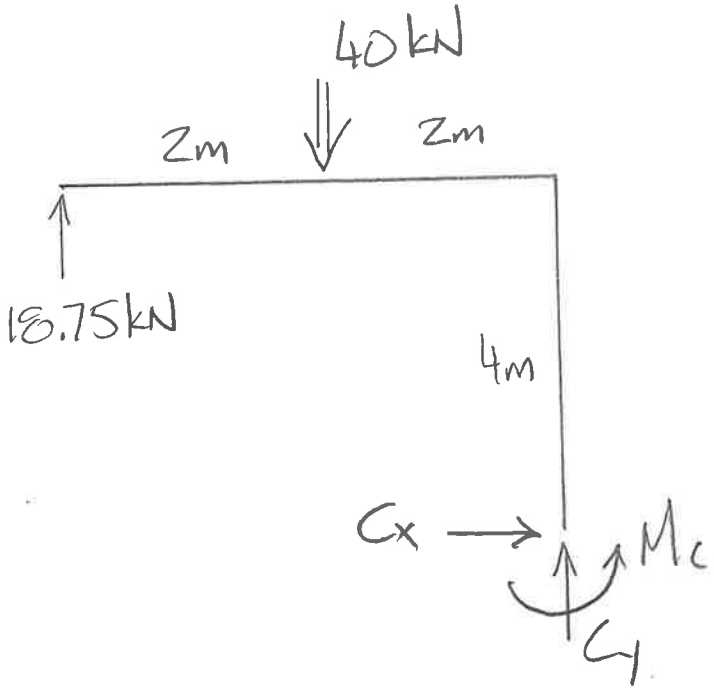
$$= \frac{5x^4}{4}\Big|_0^4 + 320y\Big|_0^4 = 1{,}600\,kNm^3$$

$$EI f_{AA} = \int_0^4 (-x)^2 dx + \int_0^4 (4)^2 dy = \frac{x^3}{3}\Big|_0^4 + 16y\Big|_0^4$$

$$= \frac{256\ m^3}{3}$$

$$\Delta_A + A_y f_{AA} = 0 = \frac{7{,}600\ kN\,m^3}{EI} + A_y\left(\frac{256\ m^3}{3EI}\right)$$

$$\underline{A_y = -18.75\ kN}$$



$$\circlearrowleft \sum M_C = 0 = M_C + 40kN(2m) - 18.75kN(4m)$$

$$\underline{M_C = -5\ kNm}$$

$$+\uparrow \sum F_y = 0 = C_y + 18.75kN - 40kN$$

$$\underline{C_y = 21.25\ kN}$$

$$\xrightarrow{+} \sum F_x = 0 = C_x$$