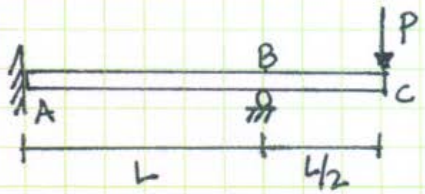
# Solution for Q5




Refer to FBD of the beam

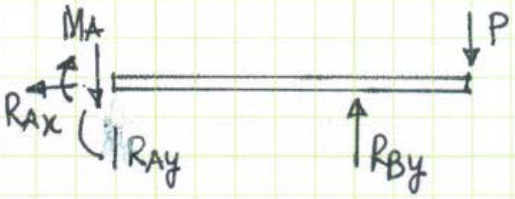
$\pm \Sigma F_x = 0$: $R_{Ax} = 0$

$+\uparrow \Sigma F_y = 0$: $R_{By} - P - R_{Ay} = 0$

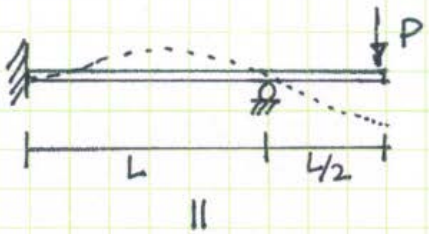
$R_{Ay} = R_{By} - P$ (1)

$\circlearrowleft + \Sigma M_A = 0$: $-M_A + R_{By} L - P(\frac{3}{2}L) = 0$ → 2

$\Rightarrow M_A = R_{By} L - \frac{3}{2} PL$. (2)




The necessary deflections are computed as follows for the two cases which when superposed give the actual loading case.

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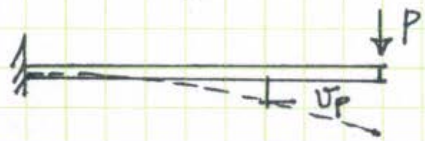


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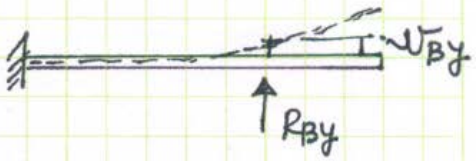


$V_P = \frac{Px^2}{6EI}(3L_{AC} - x)$

$= \frac{P(L^2)}{6EI}\left[3(\frac{3}{2}L) - L\right] = \frac{7PL^3}{12EI}\downarrow$ → 6

$V_{By} = \frac{P(L_{AB})^3}{3EI} = \frac{R_{By} L^3}{3EI}$ → 4

The compatibility condition at support B requires that

$+\downarrow \quad 0 = V_P + V_{By}$

$0 = \frac{7PL^3}{12EI} + \left(-\frac{R_{By} L^3}{3EI}\right)$ → 5

$\Rightarrow R_{By} = \frac{7P}{4}$ ANS

Sub. $R_{By}$ in eqn. (1) & (2)

$R_{Ay} = \frac{3P}{4}$

& $M_A = \frac{PL}{4}$ ANS.

→ 3 (for final answer)