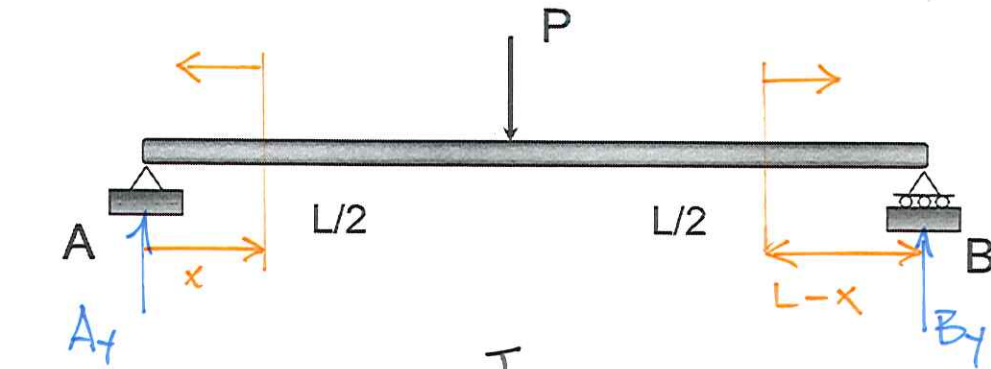


**Example 7a-3:** Determine the equations for slope and displacement in the following beam.



**I**  
 $0 \leq x \leq L/2$   
  
 $\sum M_{cut} = 0 = M - \frac{P}{2}x$   
 $\underline{M_I = \frac{Px}{2}}$

$$\Theta_I = \int \frac{M_I}{EI} dx = \frac{P}{2EI} \int x dx = \frac{P}{2EI} \frac{x^2}{2} + C_1$$

$$Y_I = \int \Theta_I dx = \frac{P}{2EI} \left( \frac{x^3}{6} \right) + \underline{C_1 x} + \underline{C_2}$$

①  $Y(x=0) = 0 = \underline{C_2}$

③  $\Theta_I(L/2) = \Theta_{II}(L/2)$

④  $Y_I(L/2) = Y_{II}(L/2)$

$$\begin{aligned} \sum M_A = 0 &= -P(L/2) + B_y(L) & B_y &= P/2 \\ \sum F_y = 0 &= A_y + B_y - P & A_y &= P/2 \end{aligned}$$

**II**  
 $L/2 \leq x \leq L$   
  
 $\sum M_{cut} = 0 = -M + \frac{P}{2}(L-x)$   
 $\underline{M_{II} = \frac{P}{2}(L-x)}$

$$\Theta_{II} = \int \frac{M_{II}}{EI} dx = \frac{P}{2EI} \left( Lx - \frac{x^2}{2} \right) + C_3$$

$$Y_{II} = \int \Theta_{II} dx = \frac{P}{2EI} \left( \frac{Lx^2}{2} - \frac{x^3}{6} \right) + \underline{C_3 x} + \underline{C_4}$$

②  $Y(x=L) = 0 = \frac{PL^3}{EI} + \underline{C_3 L} + \underline{C_4}$