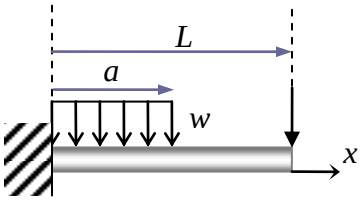
AEE 361 **Quiz** **23-11-2009**

1. Find the expressions for the Shear and Moment as a function of x for the beam with loading shown below:



Step 1. Draw the free body diagram (include dimensions, x-coordinate, applied forces and reactions. Find the reactions. (4 points)

Step 2. Make the necessary number of imaginary cuts and draw the free body diagrams to determine expressions for V(x) and M(x). (6 points)

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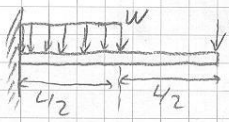
11/11

23.11.2009
Monday

= Quiz =



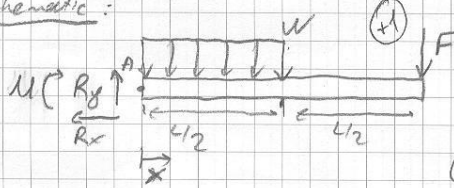
① Draw the FBD w/ all information
Find the reactions

② Make section cuts and from the partial FBD's, determine the moment and shear forces as a function of x.

Given: The loads and geometry

Find: - FBD
- Moment and shear functions wrt. x

Schematic: (+1)



Analysis:

$(\rightarrow)\ \Sigma F_x = 0$

$\boxed{R_x = 0}$

$(+\uparrow)\ \Sigma F_y = 0$

$R_y - F - w\cdot\frac{L}{2} = 0$ (+1)

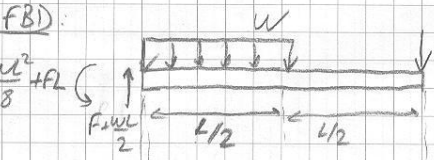
$\boxed{\vec{R_y} = F + \frac{wL}{2}\ (\uparrow)}$ (+1)

$(\circlearrowleft)\ \Sigma M_A = 0$

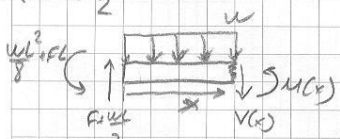
$-M - \frac{wL}{2}\cdot\frac{L}{4} - F\cdot L = 0$

$\boxed{\vec{M} = \frac{wL^2}{8} + FL\ (\circlearrowleft)}$ (+1)

FBD: (+2)



$0 < x < \frac{L}{2}$



$(+\uparrow)\ \Sigma F_y = 0$

$V(x) + wx - \left(F + \frac{wL}{2}\right) = 0$

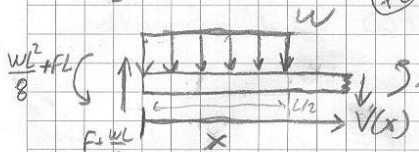
$\boxed{V(x) = F + \frac{wL}{2} - wx}$ ✓ (+1)

$(+\circlearrowleft)\ \Sigma M_x = 0$

$M(x) + wx\cdot\frac{x}{2} + \frac{wL^2}{8} + F\cdot L - \left(F + \frac{wL}{2}\right)x = 0$

$\boxed{M(x) = \left(F + \frac{wL}{2}\right)x - \frac{wx^2}{2} - \frac{wL^2}{8} - FL}$ (+1)

$\frac{L}{2} < x < L$ (+2)



$(+\downarrow) \sum F_y = 0$

$V(x) + \frac{wL}{2} - F - \frac{wL}{2} = 0$

$\boxed{V(x) = F}$ (+1)

$(+\circlearrowleft) \sum M = 0$

$M(x) + \frac{wL^2}{8} + FL + \frac{wL}{2}\left(x - \frac{L}{4}\right) - \left(F + \frac{wL}{2}\right)x = 0$

$\boxed{M(x) = \left(F + \frac{wL}{2}\right)x - \frac{wL^2}{8} - FL - \frac{wL}{2}\left(x - \frac{L}{4}\right)}$ (+1)

$= F(x - L)$