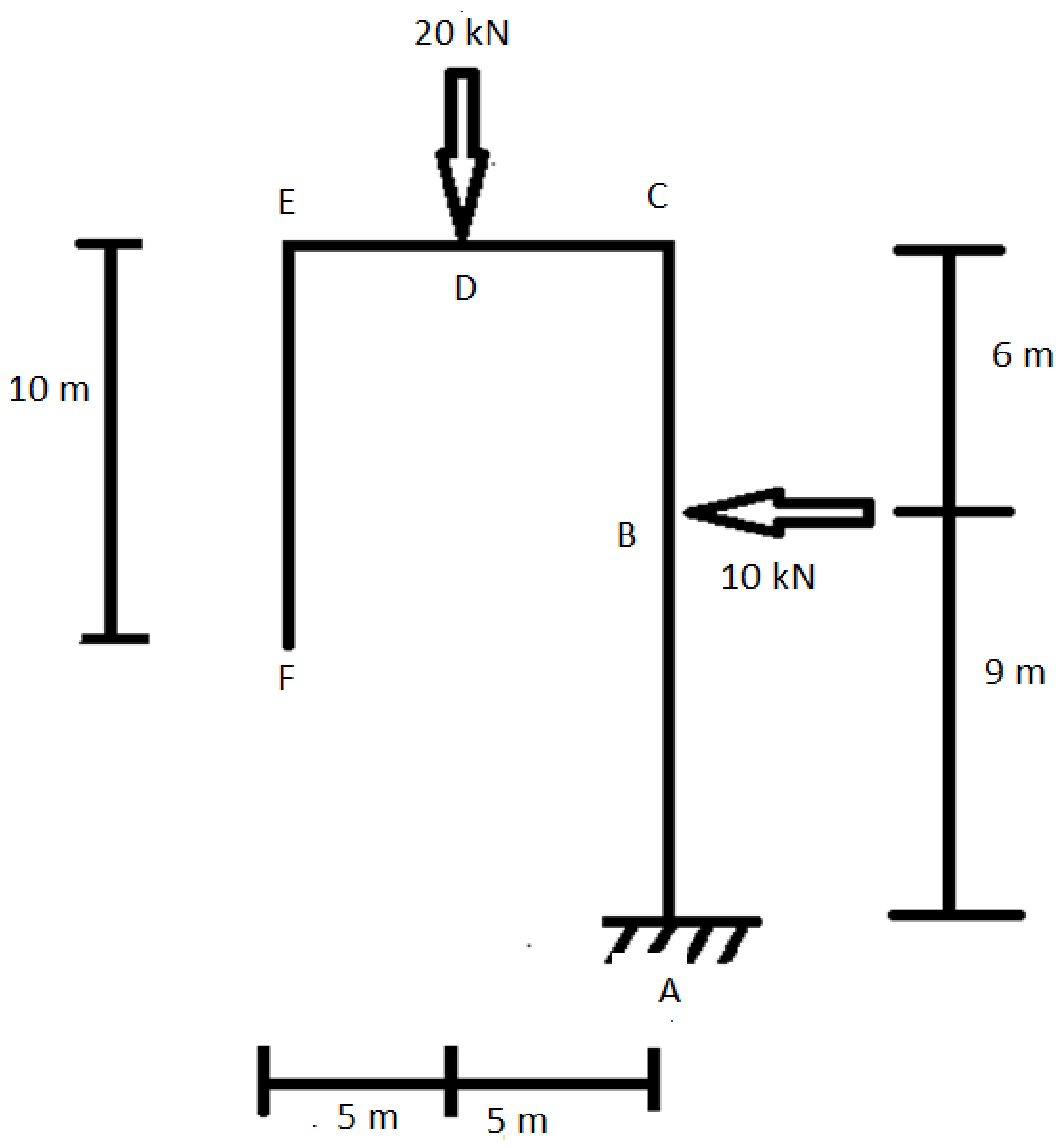
Question: Find Deflection at 'F' , Δ_F = ?

Rotation at 'F', θ_F = ?.

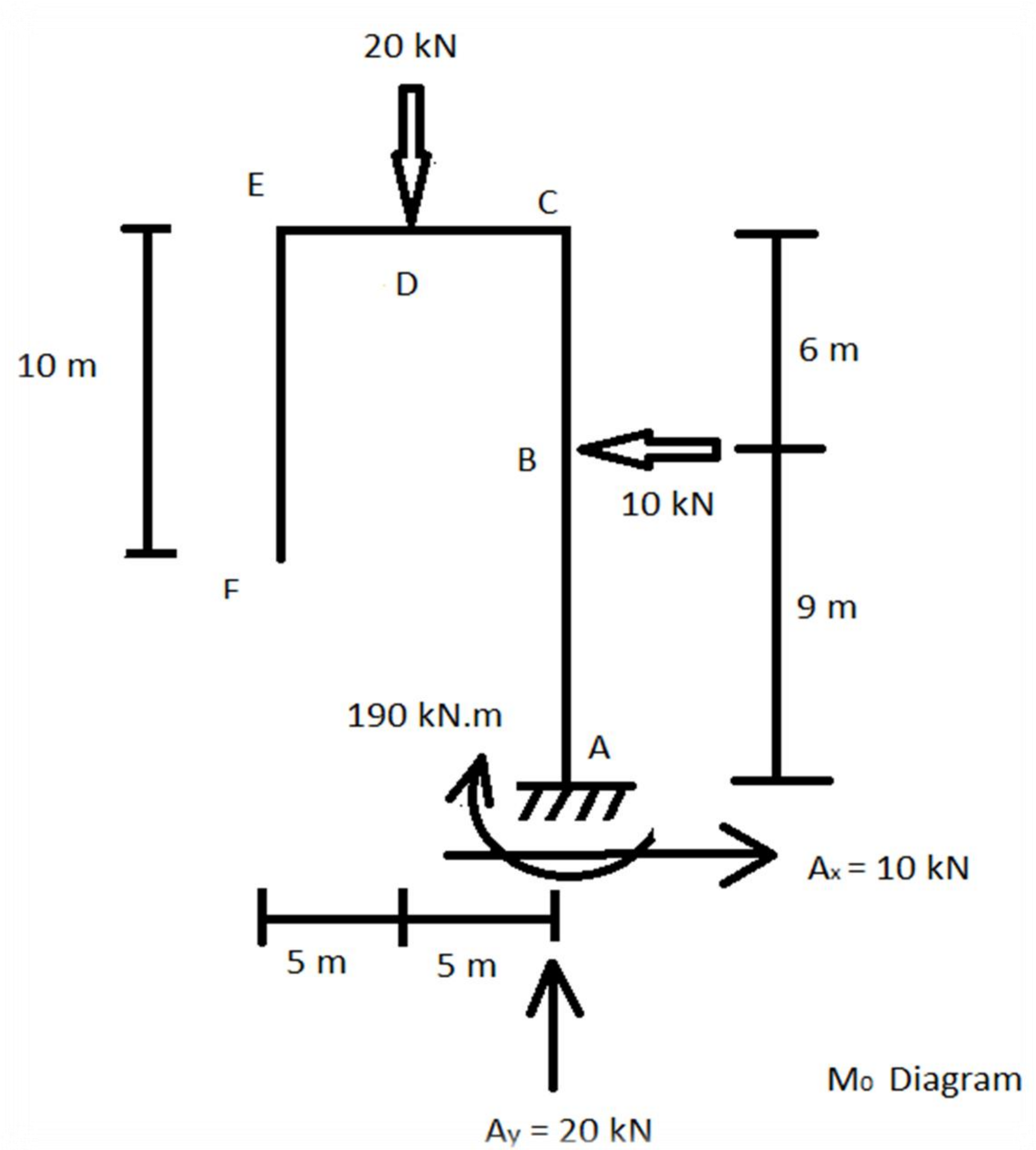


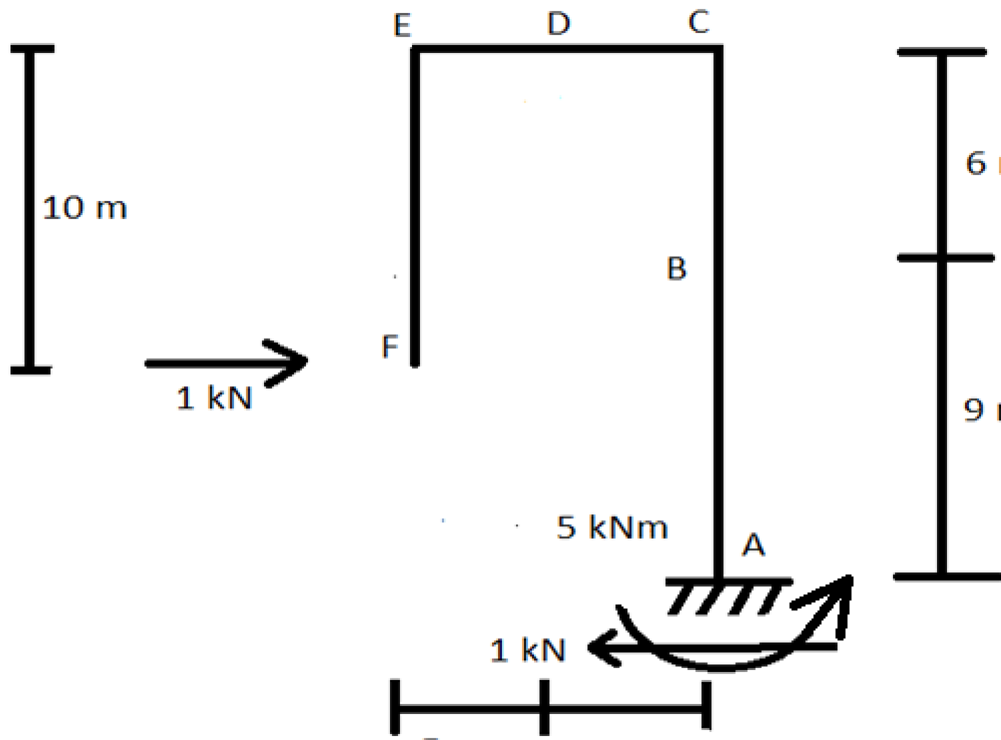
Solution:

We know ,

Deflection $\Delta = \int \frac{M_0 M_1}{EI} dx$

Rotation $\theta = \int \frac{M_0 M_1}{EI} dx$





M₁ Diagram for Deflection

$\Delta_F = \int \frac{M_0 M_1}{EI} dx$

$EI.\Delta_F = \int_0^{5\ D\rightarrow C} (-20.x).(-10.x)dx$

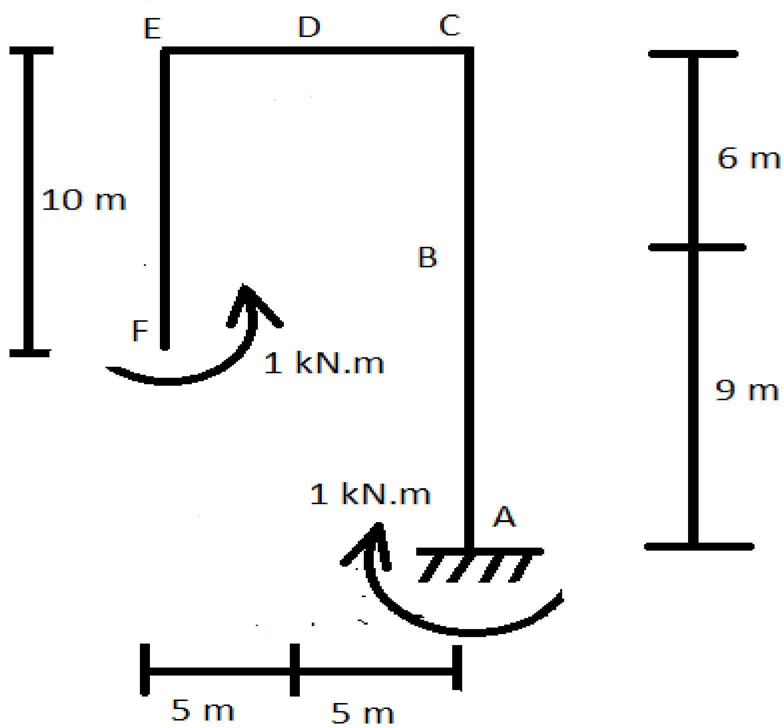
$+ \int_0^{6\ B\rightarrow C} \{(-10.x) - 190 + 10.(9+x)\}.\{-1.(9+x) + 5\}dx$

$+ \int_0^{9\ A\rightarrow B} \{10.x - 190\}.\{-1.x + 5\}dx$

= 2500 + 4200 + (-1260)

=5440

$\Delta_F = \frac{5440}{EI}$ kN.m^3



M1 Diagram for rotation

1 kN.m moment is applied at F

$\Theta_F = \int \frac{M_0 M_1}{EI} dx$

$EI.\theta_F = \int_0^{5\ D\rightarrow C} (-20.x).(-1.x)dx$

$+ \int_0^{6\ B\rightarrow C} \{(-10.x) - 190 + 10.(9+x)\}.\{-1.x\}dx$

$+ \int_0^{9\ A\rightarrow B} \{10.x - 190\}.\{-1.x\}dx$

= 250 + 600 + 1305

=2155

$\theta_F = \frac{2155}{EI}$ (Assumption Correct, Counter colckwise)

Credit: Wakil Ahmed, Jan 4, 2016