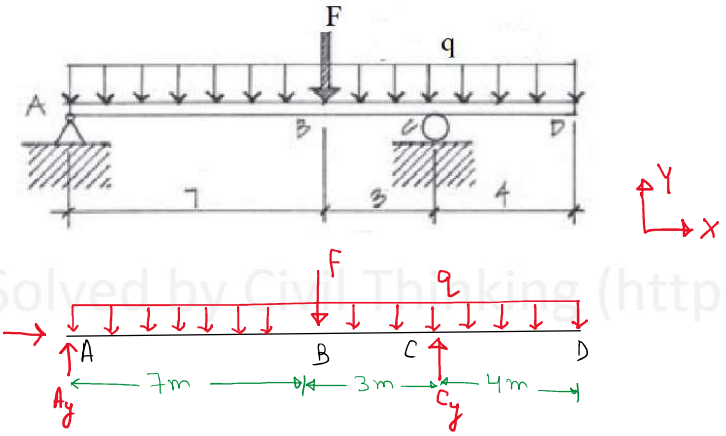
Load, Shear and Moment Diagrams:

1.Draw the load, shear, and moment diagrams for the illustrated single overhang beam with a uniform and concentrated load. (***Note:*** *Single overhangs develop two points of possibile* M_{max}). F=1200N, q=200N/m



$\overset{+}{\circlearrowleft} \Sigma M_A = 0$:

$C_y \times (3m+7m) - (F \times 7m) - q(7m+3m+4m) \times \frac{7m+3m+4m}{2} = 0$

$\Rightarrow 10C_y - 7F - \frac{14^2}{2}q = 0$

$\Rightarrow 10C_y = 7F + \frac{14 \times 14}{2}q$

$\Rightarrow 10C_y = 7F + \frac{7x2 \times 14}{2}q$

$\Rightarrow 10C_y = 7F + 98q$

$\Rightarrow C_y = 0.7F + 9.8q$

$F = 1200N$; $q = 200N/m$ [Provided in the problem]

$\Rightarrow C_y = 0.7 \times 1200N + 9.8 \times 200N/m$

$\Rightarrow C_y = 2800N$

$+\uparrow \Sigma F_y = 0$:

$A_y + C_y - F - q(7m+3m+4m) = 0$

$\Rightarrow A_y = (14m)q + F - C_y$

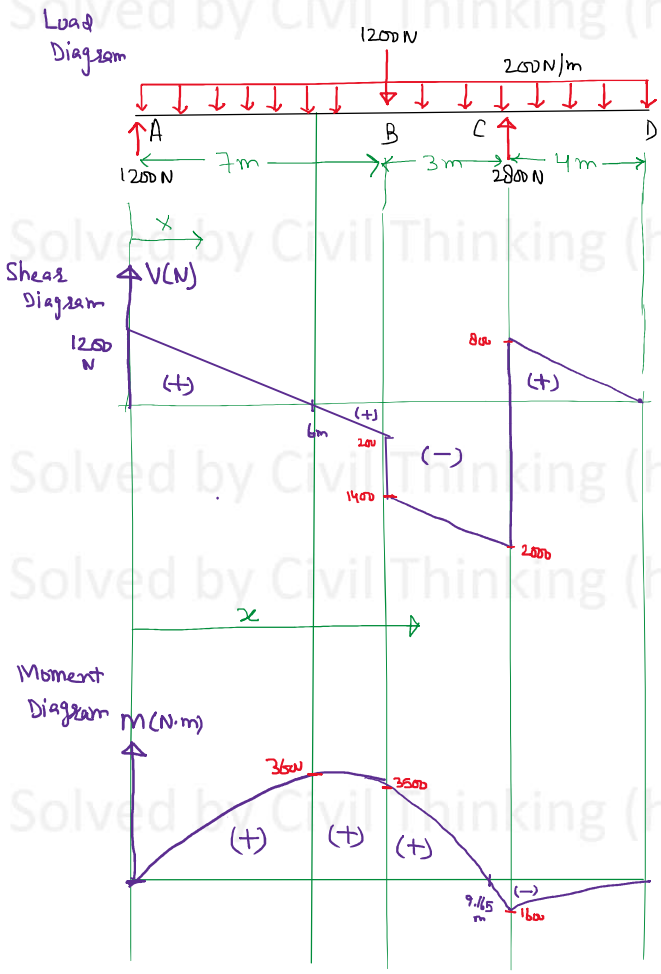
$C_y = 2800N$; $F = 1200N$; $q = 200N/m$

$\Rightarrow A_y = (14m)(200N/m) + 1200N - 2800N$

$\Rightarrow A_y = 1200N$

$\overset{+}{\rightarrow} \Sigma F_x = 0$:

$A_x = 0$



Shear forces at different locations (↑+):

→ $V_A = 1200\ N$

→ $V_{B^-} = 1200 - 200 \times 7 = -200\ N$

Zero Shear force location between A and B.

$+\uparrow \quad V_x = 0$

$1200 - 200x = 0 \Rightarrow 12 = 2x \Rightarrow x = \frac{12}{2} = 6m$

→ $V_{C^-} = 1200 - 200(7m+3m) - 1200 = -2000\ N$

→ $V_D = 0$

Moments :-

→ Nature of Moment curve:

Parabolic because Moment due to 200N/m is $200\frac{x^2}{2}$

→ $M_A = 0$; $M_{6m} = 1200N(6) - 200\left(\frac{6^2}{2}\right) = 3600\ N.m$

→ $M_B = 1200N(7) - 200\left(\frac{7^2}{2}\right) = 3500\ N.m$

→ $M_C = 1200N(7+3) - 200\left(\frac{(7+3)^2}{2}\right) - 1200N(3) = -1600\ N.m$

Zero moment location between B and C :

$M_x = 0$

$\Rightarrow 1200x - 200\frac{x^2}{2} - 1200(x-7) = 0$

$\Rightarrow x = 9.165\ m$

→ $M_D = 0$