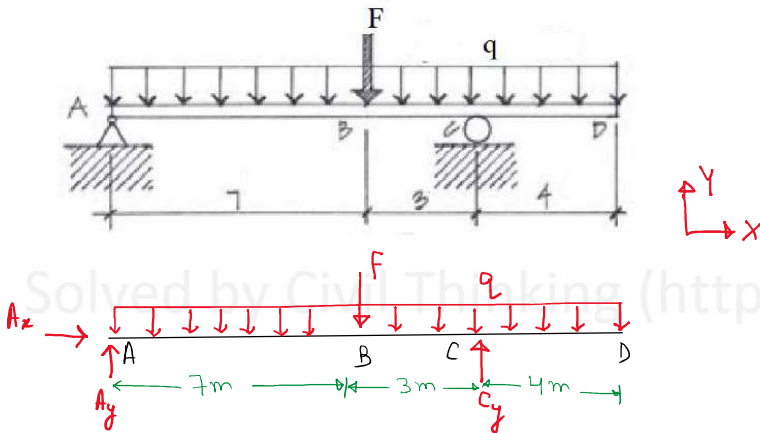


Load, Shear and Moment Diagrams:

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 possible M_{max}). $F=1200\text{N}$, $q=200\text{N/m}$



$$\sum M_A = 0:$$

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

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

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

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

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

$$\Rightarrow C_y = 0.7F + 9.8q$$

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

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

$$\Rightarrow C_y = 2800\text{N}$$

$$\sum F_y = 0:$$

$$A_y + C_y - F - q(7\text{m} + 3\text{m} + 4\text{m}) = 0$$

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

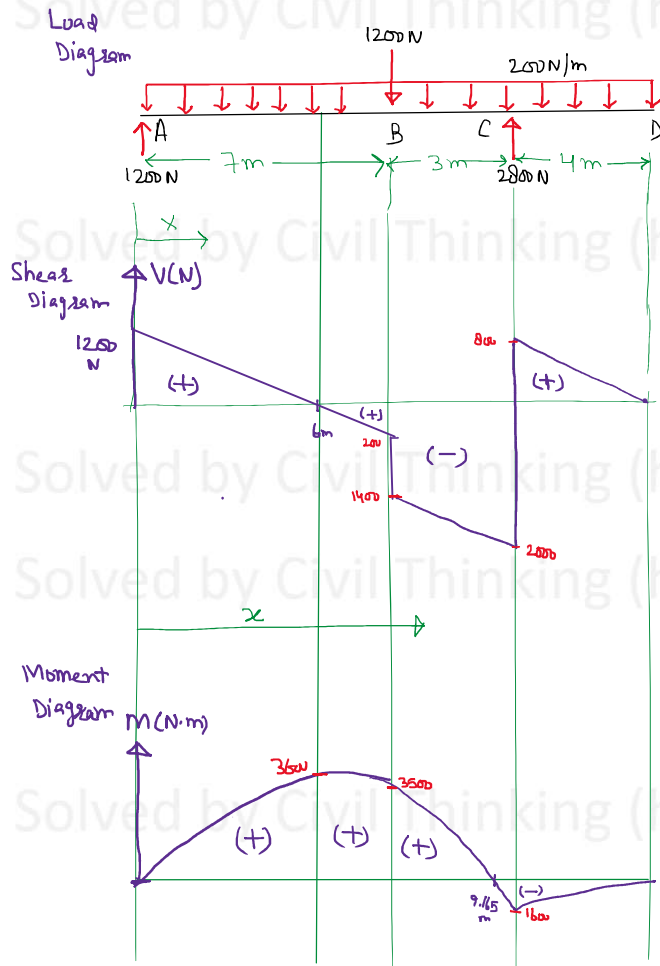
$$C_y = 2800\text{N}; F = 1200\text{N}; q = 200\text{N/m}$$

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

$$\Rightarrow A_y = 1200\text{N}$$

$$\sum F_x = 0:$$

$$A_x = 0$$



Shear forces at different locations (↑):

$$\rightarrow V_A = 1200 \text{ N}$$

$$\rightarrow V_B = 1200 - 250 \times 7 = -200 \text{ N}$$

Zero shear force location between A and B.

$$\uparrow V_x = 0$$

$$1200 - 250x = 0 \Rightarrow 12 = 2x \Rightarrow x = \frac{12}{2} = 6 \text{ m}$$

$$\rightarrow V_C = 1200 - 250(7+3) - 2800 = -2000 \text{ N}$$

$$\rightarrow V_D = 0$$

Moments :-

→ Nature of Moment curve:

Parabolic because moment due to 250 N/m is $250 \frac{x^2}{2}$

$$\rightarrow M_A = 0; M_B = 1200(6) - 250\left(\frac{6^2}{2}\right) = 3600 \text{ N.m}$$

$$\rightarrow M_B = 1200(7) - 250\left(\frac{7^2}{2}\right) = 3500 \text{ N.m}$$

$$\rightarrow M_C = 1200(7+3) - 250\left(\frac{(7+3)^2}{2}\right) - 2800(3) = -1600 \text{ N.m}$$

Zero moment location between B and C:

$$M_x = 0$$

$$\Rightarrow 1200x - 250 \frac{x^2}{2} - 1200(x-7) = 0$$

$$\Rightarrow x = 9.165 \text{ m}$$

$$\rightarrow M_D = 0$$

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