

QUESTION

10. A vertical column of height h is supported by a fixed base. The column is subjected to a uniformly distributed load of intensity w acting horizontally. The deflection of the column is given by the equation $y = \frac{w}{24EI} x^2 (3h - x)$, where x is the distance from the top of the column. The maximum deflection of the column is:



ANSWER

- (A) $\frac{wh^3}{24EI}$ (B) $\frac{wh^3}{12EI}$ (C) $\frac{wh^3}{8EI}$ (D) $\frac{wh^3}{6EI}$

SOLUTION

Given: $y = \frac{w}{24EI} x^2 (3h - x)$

At $x = 0$,

Deflection	Slope	Shear	Moment
$y = 0$	$\frac{dy}{dx} = \frac{w}{24EI} (6hx - x^2)$	$\frac{d^2y}{dx^2} = \frac{w}{24EI} (6h - 2x)$	$\frac{d^3y}{dx^3} = \frac{w}{24EI} (-2)$
At $x = h$	$\frac{dy}{dx} = \frac{w}{24EI} (6h^2 - h^2) = \frac{5wh^2}{24EI}$	$\frac{d^2y}{dx^2} = \frac{w}{24EI} (6h - 2h) = \frac{4wh}{24EI} = \frac{wh}{6EI}$	$\frac{d^3y}{dx^3} = \frac{w}{24EI} (-2)$

∴ The maximum deflection of the column is $\frac{5wh^2}{24EI}$.