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15/ENG01/005  
ENG 381

$$\frac{d^2 y}{d\theta^2} + 4 \frac{dy}{d\theta} + 5y = 6 \sin \theta$$

$$m^2 + 4m + 5 = 0$$

$$m \quad b=4 \quad a=1 \quad c=5$$

$$\frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

$$\frac{-4 \pm \sqrt{16 - 4 \times 5}}{2}$$

$$\frac{-4 \pm \sqrt{-4}}{2}$$

$$\frac{-2 \pm \sqrt{-1}}{2}$$

$$y = e^{-2\theta} (A \cos \theta + B \sin \theta)$$

$$y = C \cos \theta + D \sin \theta$$

$$\frac{dy}{d\theta} = -C \sin \theta + D \cos \theta$$

$$\frac{d^2 y}{d\theta^2} = -C \cos \theta - D \sin \theta$$

$$-C \cos \theta - D \sin \theta + 4(-C \sin \theta + D \cos \theta) + 5(C \cos \theta + D \sin \theta) = 6 \sin \theta$$

$$-C \cos \theta - D \sin \theta + 4C \sin \theta + 4D \cos \theta + 5C \cos \theta + 5D \sin \theta = 6 \sin \theta$$

$$4C \cos \theta + 4D \cos \theta = 0 \rightarrow \textcircled{1}$$

$$-4C \sin \theta + 4D \sin \theta = 6 \sin \theta \rightarrow \textcircled{2}$$

$$8D = 6$$

$$D = \frac{3}{4}$$

$$C = -\frac{3}{4}$$

$$y = e^{-2\theta} (A \cos \theta + B \sin \theta) + \frac{3}{4} \cos \theta + \frac{3}{4} \sin \theta$$

$$2) EI \frac{d^2y}{dx^2} = \frac{w}{2} (l-x)^2$$

$$EI m^2 = 0 \quad (l-x)^2$$

$$m^2 = 0$$

$$m = \pm 0$$

$$y = e^{0x} [A + Bx] \quad y = A + Bx$$

$$y^2 = (l-x)^2$$

$$(l-x)(l-x)$$

$$[(l-2x+x^2)]$$

$$y = Cx^2 + Dx^3 + Ex^4$$

$$\frac{dy}{dx} = 2Cx + 3Dx^2 + 4Ex^3$$

$$\frac{d^2y}{dx^2} = 2C + 6Dx + 12Ex^2$$

$$EI(2C + 6Dx + 12Ex^2) = \frac{w}{2} [l^2 - 2lx + x^2]$$

$$2CEI + 6DxEI + 12E^2EI = w[l^2 - 2wlx + wx^2]$$

$$4EI + 12DxEI + 24E^2EI = wl^2 - 2wlx + wx^2$$

$$24E^2EI = wl^2$$

$$E = \frac{wl^2}{24EI}$$

$$24EI$$

$$12DxEI = -2wlb$$

$$D = \frac{-2wlb}{12EI}$$

$$12EI$$

$$4EI = wl^2$$

$$C = \frac{wl^2}{4EI}$$

$$y = \left[ \frac{\omega l^2}{4EI} \right] x^2 - \left[ \frac{\omega l}{6EI} \right] x^3 + \left[ \frac{\omega}{24EI} \right] x^4$$

$$= \frac{\omega l^2 x^2}{4EI} - \frac{\omega l x^3}{6EI} + \frac{\omega x^4}{24EI}$$

$$= \frac{6\omega l^2 x^2 - 4\omega l x^3 + \omega x^4}{24EI}$$

$$y = A + Bx + \frac{\omega}{24EI} [6l^2 x^2 + 4lx^3 + x^4]$$

$$x=0 \quad \frac{dy}{dx} = 0 \quad a+y=0$$

$$0 = A + B(0) + \frac{\omega}{24EI} [6l^2(0) - 4l(0) + 0]$$

$$A = 0$$

$$\frac{dy}{dx} = B + \frac{\omega}{24EI} [12lx + 12lx^2 + 4x^3]$$

$$x=0$$

$$0 = B$$

$$y = \frac{\omega x}{24EI} [6l^2 - 4lx + x^2]$$

when  $x = l$

$$y = \frac{\omega l^2}{24EI} [l^2 - 4l^2 + 6l^2]$$

$$= \frac{\omega l^2}{24EI} \times 3l^2$$

$$= \frac{\omega l^4}{8EI}$$