FRENCH ERERE CIVIL ENGINEERING
16/ENG03/059
ENG 381

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

C.F

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

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

$\frac{-4 \pm \sqrt{4^2-4(1)(5)}}{2(1)} = m$

$= \frac{-4 \pm \sqrt{16-20}}{2}$

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

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

$m = -2 \pm j$

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

$p = I$

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

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

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

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

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

comparing weficient

$-C - 4D + 5C = 6$ —(i)

$-D + 4C + 5D = 0$ —(ii)

$4C - 4D = 6$

$4D + 4C = 0$

$0 - 8D = 6$

$D = \frac{-6}{8} = -3/4$

$$\frac{-4 \pm \sqrt{16-20}}{2}$$

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

$$-2 + j$$

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

Solution

C.F

$EIm^2 = 0$

$m^2 = 0$

$m = \sqrt{0}$

$m = 0$

$y = e^{0x}(A + Bx)$

$y = A + Bx$

P.I

$y = Gx^2 + Hx^3 + Zx^4$

$\frac{dy}{dx} = 2Gx + 3Hx^2 + 4Zx^3$

$\frac{d^2y}{dx^2} = 2G + 6Hx + 12Zx^2$

$EI(2G + 6Hx + 12Zx^2) = \frac{w}{2}(L-x)^2$

$$\frac{-4 \pm \sqrt{16-20}}{2}$$

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

$$-2 + j$$

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

Solution

C.F

$EIm^2 = 0$

$m^2 = 0$

$m = \sqrt{0}$

$m = 0$

$y = e^{0x}(A + Bx)$

$y = A + Bx$

P.I

$y = Gx^2 + tbx^3 + zx^4$

$\frac{dy}{dx} = 2Gx + 3tbx^2 + 4zx^3$

$\frac{d^2y}{dx^2} = 2G + 6tbx + 12zx^2$

$EI(2G + 6tbx + 12zx^2) = \frac{w}{2}(L-x)^2$

$2GEI + 6tbxEI + 12zx^2EI = \frac{w}{2}(L^2 - 2Lx + x^2)$

$$y = \frac{w}{24EI}(6L^2x^2 - 4Lx^3 + x^4)$$

G.S

$$y = A + Bx + \frac{w}{24EI}(6L^2x^2 - 4Lx^3 + x^4)$$

at $y = 0, x = 0 \quad \frac{dy}{dx} = 0$

$$0 = A + B(0) + \frac{w}{24EI}[(6L^2(0)^2 - 4L(0)^3 + 0^4]$$

$0 = A$

$A = 0$

$$\frac{dy}{dx} = B + \frac{w}{24EI}(12L^3x - 12Lx^2 + 4x^3)$$

$$0 = B + \frac{w}{24EI}[(12L^3(0) - 12L(0)^2 + 4(0)]$$

$$y = \frac{w}{24EI}(6l^2x^2 - 4lx^3 + x^4)$$

$$y = \frac{w}{24EI}x^2(6l^2 - 4lx + x^2)$$

$$x = l$$

$$y = \frac{wl^2}{24EI}(6l^2 - 4l^2 + l^2)$$

$$y = \frac{wl^2}{24EI}(3l^2)$$

$$y = \frac{3wl^4}{24EI}$$

$$y = \frac{wl^4}{8EI}$$