

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

C.F

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

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

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

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

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

$$-2 \pm j2$$

$$m = -2 \pm j$$

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

P.I

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

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

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

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

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

Comparing coefficient,

$$-C - D + 5C = 6 \quad \text{--- (i)}$$

$$-D + C + 5D = 0 \quad \text{--- (ii)}$$

$$4C - 4D = 6$$

$$4D + 4C = 0$$

$$0 - 8D = 6$$

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

Wavy line and arrow pointing right with $(+9) - 1$

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

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

$$-2 \pm j$$

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

Solution

C.F

$$EI m^2 = 0$$

$$m^2 = 0$$

$$m = \sqrt{0}$$

$$m = 0$$

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

$$y = A+Bx$$

P.I

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

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

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

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

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

$$4GEI + 12HxEI + 24Zx^2EI = w(L^2 - 2Lx + x^2)$$

Comparing Coefficient

$$x^2 \quad 24ZEI = w$$

$$Z = \frac{w}{24EI}$$

$$x \quad 12HEI = -2wL$$

$$H = \frac{-2wL}{12EI}$$

$$H = \frac{-wL}{6EI}$$

$$4GEI = wL^2$$

$$G = \frac{wL^2}{4EI}$$

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

$$y = \frac{wL^2x^2}{4EI} - \frac{wLx^3}{6EI} + \frac{wx^4}{24EI}$$

$$y = \frac{6wL^2x^2 - 4wLx^3 + wx^4}{24EI}$$

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

G.S

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

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

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

$$0 = A$$

$$A = 0$$

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

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

$$B = 0$$

P.S

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

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

$$x = L$$

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

$$y = \frac{wL^2}{24EI} (3L^2)$$

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

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