

IYAGBA THELMA

IS/ENG04/033

ELECT/ELECT ENG

ENG 381

Assignment 2

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

solution:

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

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

$$= \frac{-4 \pm \sqrt{4^2 - 20}}{2 \times 1}$$

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

$$= \frac{-4 \pm 2\sqrt{-1}}{2}$$

$$= \frac{-4 \pm j2}{2} = -2 \pm j$$

$$C.F = y = e^{-2\theta} [C \cos \theta + D \sin \theta]$$

$$P.I = y = A \cos \theta + B \sin \theta$$

$$\frac{dy}{d\theta} = -A \sin \theta + B \cos \theta$$

$$\frac{d^2y}{d\theta^2} = -A \cos \theta - B \sin \theta$$

$$-A \cos \theta - B \sin \theta - 4A \sin \theta + 4B \cos \theta + 5A \cos \theta + 5B \sin \theta = 6 \sin \theta$$

$$\cos \theta (-A + 4B + 5A) + \sin \theta (-B - 4A + 5B) = 6 \sin \theta$$

$$4A + 4B = 0 \quad - (1)$$

$$4B - 4A = 6 \quad - (2)$$

Adding (1) and (2)

$$4A + 4B = 0$$

$$+ \quad -4A + 4B = 6$$

$$\hline 8B = 6$$

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

$$4A + 4\left(\frac{3}{4}\right) = 0$$

$$4A + 3 = 0$$

$$4A = -3$$

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

$$P.I = y = \frac{-3}{4} \cos \theta + \frac{3}{4} \sin \theta$$

$$G.E = y = e^{-2\theta} (\cos\theta + D\sin\theta) - \frac{3}{4}\cos\theta + \frac{3}{4}\sin\theta$$

at $\theta = \omega$ and $\frac{dy}{d\theta} = 0$

$$\frac{dy}{d\theta} = e^{-2\theta} [-\sin\theta + D\cos\theta] + [\cos\theta + D\sin\theta] - 2e^{-2\theta} + \frac{3}{4}\sin\theta + \frac{3}{4}\cos\theta$$

$$0 = \frac{3}{4}\sin\theta + \frac{3}{4}\cos\theta$$

$$-\frac{3}{4}\cos\theta = \frac{3}{4}\sin\theta$$

$$-\cos\theta = \sin\theta$$

$$-1 = \tan\theta$$

$$\theta = \tan^{-1}(-1)$$

$$= -45^\circ$$

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

Solution

$$EI m^2 = 0$$

$$m^2 = 0$$

$$m = \pm \sqrt{0}$$

$$m = \pm 0$$

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

$$y = A + Bx$$

$$P.I = y = Fx^2 + Gx^3 + Hx^4$$

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

$$\frac{d^2 y}{dx^2} = 2F + 6Gx + 12Hx^2$$

$$EI [2F + 6Gx + 12Hx^2] = \frac{w}{2} (L-x)^2$$

$$2FEI + 6GEIx + 12HEIx^2 = \frac{w}{2} (L-x)^2$$

$$4FEI + 12GEIx + 24HEIx^2 = w(L^2 - 2Lx + x^2)$$

$$24HEI = w$$

$$H = \frac{w}{24EI} \quad \text{--- (1)}$$

$$12GEI = -2wL$$

$$G = \frac{-2wL}{12EI} = \frac{-wL}{6EI} \quad \text{--- (2)}$$

$$4FEI = wL^2$$

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

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

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

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

$$G.E = y = A + Bx + \frac{w}{24EI} [6L^2 x^2 - 4Lx^3 + x^4] \quad \text{---}$$

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

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

$$A = 0$$

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

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

$$B = 0$$

particular solution

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

$$y = \frac{wx^2}{24EI} [6L^2 - 4Lx + x^2]$$

$$y = \frac{wx^2}{24EI} [x^2 - 4Lx + 6L^2]$$

when $x=L$

$$y = \frac{wL^2}{24EI} [L^2 - 4L^2 + 6L^2] = \frac{wL^3}{24EI} [3L^2]$$

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