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DEPT: ELECTRICAL/ELECTRONICS

COURSE: ENG 381 (ENGINEERING MATHEMATICS)

Assignment 2

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

$$y'' + 4y' + 5y = 6 \sin \theta$$

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

$$k^2 + 4k = -5$$

$$k^2 + 4k + (2)^2 = -5 + (2)^2$$

$$(k+2)^2 = -1$$

$$k+2 = \pm \sqrt{-1}$$

$$k+2 = \pm i$$

$$y_h = C_1 e^{(-2+i)\theta} + C_2 e^{(-2-i)\theta}$$

$$y_h = C_1 e^{-2\theta + i\theta} + C_2 e^{-2\theta - i\theta}$$

$$y_h = C_1 e^{-2\theta} \cdot e^{i\theta} + C_2 e^{-2\theta} \cdot e^{-i\theta}$$

$$y_h = e^{-2\theta} [C_1 e^{i\theta} + C_2 e^{-i\theta}]$$

$$y_h = e^{-2\theta} [A \cos \theta + B \sin \theta]$$

$$y_p = A \cos \theta + B \sin \theta$$

$$y_p' = -A \sin \theta + B \cos \theta$$

$$y_p'' = -A \cos \theta - B \sin \theta$$

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

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

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

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

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

$$4A + 4B = 0$$

$$8B = 6$$

$$B = \frac{6}{8} = \frac{3}{4}$$

$$4A = -4B$$

$$A = -B$$

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

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

$$y = y_1 + y_2$$

$$y = e^{-R\theta} [A \cos \theta + B \sin \theta] - \frac{3}{4} \cos \theta = \frac{3}{4} \cos \theta$$

③ STEADY STATE EQUATION

$$y'' = 0$$

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

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

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

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

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

$$\tan \theta = -1$$

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Question 2

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

$$EI m^2 = 0$$

$$m^2 = 0$$

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

$$m = \pm 0$$

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

$$y = A + Bx$$

$$y_p = y = Fx^2 + Gx^3 + Hx^4$$

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

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

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

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

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

$$24HEI = w$$

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

$$12GEI = -2wL$$

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

$$4FEI = wL^2$$

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

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

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

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

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

$$Aty = 0, \quad x = 0 \quad \frac{\partial y}{\partial x} = 0$$

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

$$A = 0$$

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

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

$$B = 0$$

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

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

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

when $x = L$

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

$$y_P = \frac{wL^2}{24EI} [3L^2]$$

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