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ASSIGNMENT 2

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

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

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

$k^2 + 4k = -5$

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

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

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

$k + 2 = \pm i$

$k_1 = -2 + i$ and $k_2 = -2 - i$

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

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

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

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

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

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

$y'_p = -A\sin\theta + B\cos\theta$

$y''_p = -A\cos\theta - B\sin\theta$

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

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

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

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

$-4A + 4B = 6$

$4A + 4B = 0$

$8B = 6$

$B = 6/8 = 3/4$

$4A = -4B$

$A = -B$

$A = -3/4$

$y_p = -3/4 \cos\theta + 3/4 \sin\theta$

$y = y_h + y_p$

$y = e^{-2\theta}[A\cos\theta + B\sin\theta] + 3/4\sin\theta - 3/4\cos\theta$

Steady State Equation

$y_p' = 0$

$y_p' = 3/4\cos\theta + 3/4\sin\theta = 0$

$3/4\cos\theta + 3/4\sin\theta = 0$

$3/4\cos\theta = -3/4\sin\theta$

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

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

$\tan\theta = -1$

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

$EIm^2 = 0$

$m^2 = 0$

$m = \pm\sqrt{0}$

$m = \pm 0$

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

$y = A + Bx$

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

$dy/dx = 2Fx + 3Gx^2 + 4Hx^3$

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

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

$$27EI + 6GEIx + 12HEIx^3 = \frac{w}{2}(L-x)^2$$

$$47EI + 2GEIx + 24HEIx^2 = w(L^2 - 2Lx + x^2)$$

$$24HEI = w$$

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

$$12GEI = -2wL$$

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

$$47EI = wL^2$$

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

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

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

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

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

$$a + y = 0, \quad x = 0 \quad dy/dx = 0$$

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

$$A = 0$$

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

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

$S = 0$

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

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

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

when $x = L$

$$y_1 = \frac{wL^2}{24EI}\left[L^2 - 4L^2 + 6L^2\right]$$

$$y_p = \frac{wL^2}{24EI}\left[3L^2\right]$$

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