[illegible]

[illegible]

[illegible]

$\frac{d^2y}{dx^2} + 4\frac{dy}{dx} + 5y = [illegible]$

[illegible]

For homogeneous

$y'' + 4y' + 5y = [illegible]$

$y'' + 4y' + 5y = 0$

Let $y = e^{mx}$, $y' = me^{mx}$

$y'' = m^2 e^{mx}$

$m^2 e^{mx} + 4m e^{mx} + 5e^{mx} = 0$

$(m^2 + 4m + 5) e^{mx} = 0$

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

$m^2 + 4m = -5 \Rightarrow m^2 + 4m + 4 = -5 + 4$

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

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

$m = -2 \pm i$

$m = -2 \pm i$

$y = c_1 y_1 + c_2 y_2$

$y = c_1 e^{m_1 x} + c_2 e^{m_2 x}$

$y = c_1 e^{(-2+i)x} + c_2 e^{(-2-i)x}$

$y = c_1 e^{-2x} \cdot e^{ix} + c_2 e^{-2x} \cdot e^{-ix}$

$y = e^{-2x}(c_1 \cos x + c_2 \sin x)$

For non homogeneous

$\frac{d^2y}{dx^2} + 4\frac{dy}{dx} + 5y = [illegible]$

[illegible]

[illegible]

$\frac{d^2y}{d\theta^2} = [illegible] \sin\theta$

[illegible] $\sin\theta$ [illegible]

$= [illegible] \sin\theta$

$\Rightarrow$ [illegible]

$\Rightarrow$ [illegible]

$\Rightarrow$ [illegible] $\cos\theta$ + [illegible] $\sin\theta$ [illegible]

[illegible] $= 0$ ... (i)

[illegible] $= 6$ ... (ii)

$8B = 6$

$B = 3/4$

$3 = -4A$

$4(3/4) = -4A$

$3 = -4A$

$A = -3/4$

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

$y = y_c + y_p$

$= e^{-x}(c_1 \cos x + c_2 \sin x) + 3/4 \sin\theta - 3/4 \cos\theta$

Steady state solution:

At steady state

$y_c = 0$

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

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

ω [illegible] $\sin\theta$

Divide through by $\cos\theta$

$1 + \tan\theta$

$\tan\theta = -1$

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

$\theta = -45^\circ$

$\theta = 225^\circ$

① $EI\frac{d^2y}{dx^2} = \frac{w}{2}(L-x)^2$

$EIm^2 = 0$

$m^2 = 0$

$m = \pm\sqrt{0}$

$m = 0, 0$

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

$y_c = A+Bx$

$y_p = \alpha x^2 + \beta x^3 + \gamma x^4$

$\frac{dy}{dx} = 2\alpha x + 3\beta x^2 + 4\gamma x^3$

$\frac{d^2y}{dx^2} = 2\alpha + 6\beta x + 12\gamma x^2$

$EI(2\alpha + 6\beta x + 12\gamma x^2) = \frac{w}{2}(L-x)^2$

$2\alpha EI + 6\beta EI x + 12\gamma EI x^2 = \frac{w}{2}(L-x)^2$

$4\alpha EI + 12\beta EI x + 24\gamma EI x^2 = w(L^2 - 2Lx + x^2)$

$24\gamma EI = w$

$\gamma = \frac{w}{24EI}$ ... (i)

$12\beta EI = -2wL$

$\beta = \frac{-2wL}{12EI} = \frac{-wL}{6EI}$ .... (ii)

$4\alpha EI = wL^2$

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

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

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

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

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

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

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

$A = 0$

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

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

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

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

max = at L

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

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

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