SAMSUNG DIGITAL CAMERA
ELECTRICAL ENGINEERING

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

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

$m = -2 \pm j$

PI $y = e^{-2x}(C\cos\theta + D\sin\theta)$

$\frac{dy}{dx} = -e^{-2x}(C\sin\theta + D\cos\theta) + e^{-2x}(-C\sin\theta + D\cos\theta)$

$\frac{d^2y}{dx^2} = -e^{-2x}(C\cos\theta - D\sin\theta) + 2e^{-2x}(C\sin\theta + D\cos\theta) + e^{-2x}(-C\cos\theta - D\sin\theta)$

$-C\cos\theta - D\sin\theta - 4C\sin\theta + 4D\cos\theta + 5C\cos\theta + 5D\sin\theta = 0\sin\theta$

$\sin\theta: -D - 4C + 5D = 6$

$\cos\theta: -C + 4D + 5C = 0$

$\sin\theta$

$4D - 4C = 6$ ——— ①

$4C + 4D = 0$ ——— ②

$-8C = 6$

$\therefore C = -\frac{6}{8}^{3}\,4 = -\frac{3}{4}$

from eqn (2)

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

$$-3/-3 = +p/+3 \quad D$$

$$\therefore D = 3/p$$

$$y = -3/p \cos\theta + 3/p \sin\theta$$

$$y = 3/p \sin\theta - 3/p \cos\theta$$

$$qs = e^{-px}(A\cos\theta + B\sin\theta) + 3/p \sin\theta - 3/p \cos\theta$$

$$= 3/p (\sin\theta - \cos\theta)$$

for $\theta = 0^\circ \times 270^\circ$

$$\frac{dy}{d\theta} = 3/p \sin\theta - 3/p \cos\theta$$

$$= 3/p \cos\theta + 3/p \sin\theta$$

at steady state

$$\frac{dy}{d\theta} = 0 \quad \text{and} \quad \theta = \infty$$

$$0 = 3/p (\cos\theta + \sin\theta)$$

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

Dividing both sides by

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

$$\tan\theta = -1$$

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

$$\theta = 45^\circ$$

$$\theta = 315^\circ$$

Comparing Coefficient

$x^2 : 24EI = w$

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

$x : 12EI = -2wL$

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

Constant : $4CEI = wL^2$

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

putting back to Original eqn

$y = \frac{-wL^3}{4EI} x^2 - \frac{3wL}{12EI} x^3 + \frac{w}{24EI} x^4$

The general Soln

$y = CF + PI$

$= A + Bx + \frac{wL}{4EI} x^2 - \frac{2wL}{12EI} x^3 + \frac{w}{24EI} x^4$

$\frac{dy}{dx} = B + \frac{2wL^2}{4EI} - \frac{6wLx^2}{12EI} + \frac{8w}{24EI} x^3$

at $y = 0$ and $x = L$

$y = A + Bx + \frac{wL^2}{4EI} x^2 - \frac{2wL}{12EI} x^3 + \frac{2wx^4}{24}$

at $0 = A$ $A = 0$

at $\frac{dy}{dx} = 0$ and $x = L$

$0 = B + \frac{2wL^2}{4EI} - \frac{6wLx^2}{12EI} + \frac{8w}{24EI} x^3$

$$0 = B + \frac{wl^2}{2EI} - \frac{wl}{2EI}x^2 + \frac{w}{3EI}x^3$$

at $B = 0$

General equation will be

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

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

at $x = l$

$$y = \frac{wl^4}{4EI} - \frac{wl^4}{6EI} + \frac{wl^4}{24EI}$$

$$y = \frac{6wl^4 - 4wl^4 + wl^4}{24EI}$$

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

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

C.F

Auxiliary Eqn

$m^2 = 0$

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

$\therefore y = e^0(A+Bx)$

$y = 1(A+Bx$

$= A + Bx$

$\frac{dy}{dx}$:

$y = Cx^2 + Dx^3 + Fx^4$

$\frac{dy}{dx} = 2Cx + 3Dx^2 + 4Fx^3$

$\frac{d^2y}{dx^2} = 2C + 6Dx + 12Fx^2$

$EI(2C + 6Dx + 12Fx^2) = 10/2(L-x)^2$

$2(EI + 6DEIx + 12EFIx^2 = 10/2(L-x^2$