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ELECT/ELECT

15/ENG04/054

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

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

$m = 2 \pm J$

PF $y = C\cos\theta + D\sin\theta$

$dy/dx = -C\sin\theta + D\cos\theta$

$d^2y/dx^2 = -C\cos\theta - D\sin\theta$

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

$+ 5D\sin\theta = 0\sin\theta$

$\sin\theta: -D - 4C + 8D = 6$

$\cos\theta: -C + 4D + 8C = 0$

Since

$4D - 4C = 6$ — (1)

$\underline{4C + 4D = 6}$ — (2)

$-8C = 6$

$\therefore C = \frac{-\cancel{6}^{3}}{\cancel{8}_{4}} = -3/4$

from eqn (1)

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

$$-\frac{3}{-3} = \frac{+4}{-3} D$$

$$\therefore D = 3/4$$

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

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

$$qs = e^{-2x}(A\cos\theta + B\sin\theta) + 3/4 \sin\theta - 3/4 \cos\theta$$

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

for $\theta = 0^{\circ}$ to 270°

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

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

at steady state

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

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

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

Divid both side by

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

$$\tan\theta = -1$$

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

$$\theta = 45^{\circ}$$

$$\therefore \theta = 315^{\circ}$$

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

C.F

Auxiliary Eqn

$m^2 = 0$

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

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

$y = 1 (A + Bx$

$= A + Bx$

$\frac{dy}{dx}$:

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

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

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

$EI(2C + 6Dx + 12Ex^2) = \frac{10}{2}(L-x)^2$

$2(EI + 6DEIx + 12EFIx^2 = \frac{10}{2}(L-x^2$

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Company Coeffient

$x^2 : 24\,EFI = w$

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

$x:\ 12DEI = -2wl$

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

Constan: $4CEI = wl^2$

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

putting back to original eqn

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

The general soln

$$y = CF + PI$$

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

$$\frac{dy}{dx} = B + \frac{2wl^2}{4EI} - \frac{6wlx^2}{12EI} + \frac{8w}{24EI}x^5$$

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

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

at $0 = A$, $A = 0$

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

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