

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

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

$$\text{Using } \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

$$a=1, b=4, c=5$$

$$\therefore \frac{-4 \pm \sqrt{4^2 - (4 \times 1 \times 5)}}{2 \times 1}$$

$$= \frac{-4 \pm \sqrt{16 - 20}}{2}$$

$$= \frac{-4 \pm \sqrt{-4}}{2}$$

$$m = -2 \pm j \quad m_1 = -2 + j, \quad m_2 = -2 - j$$

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

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

$$\frac{dy}{d\theta} = -C \sin\theta + D \cos\theta$$

$$\frac{d^2y}{d\theta^2} = -C \cos\theta - D \sin\theta$$

$$\therefore (-C \cos\theta - D \sin\theta) + 4(-C \sin\theta + D \cos\theta) + 5(C \cos\theta + D \sin\theta) = 6 \sin\theta$$

$$(-C \cos\theta - D \sin\theta - 4C \sin\theta + 4D \cos\theta + 5C \cos\theta + 5D \sin\theta) = 6 \sin\theta$$

$$(-C + 4D + 5C) \cos\theta + (-D - 4C + 5D) \sin\theta = 6 \sin\theta$$

$$(-C + 4D + 5C) = 0$$

$$-4C + 4D = 0$$

$$(-D - 4C + 5D) = 6$$

$$\therefore -4C + 5D = 6$$

$$\therefore -4C + 4D = 0 \quad \dots \text{--- (b)}$$

$$-4C + 4D = 6 \quad \dots \text{--- (a)}$$

(a) + (b)

$$\therefore -4C + 4D = 6$$

$$+4C + 4D = 0$$

$$0 \quad 8D = 6$$

$$\therefore D = 6/8 = 3/4$$

Putting $D = 3/4$ in equ (b)

$$\text{In eq } -4C + 4\left(\frac{3}{4}\right) = 0$$

$$4C = 3$$

$$C = \frac{3}{4}$$

$$\therefore y = e^{-2t} [A \cos t + B \sin t] + \frac{3}{4} \cos t + \frac{3}{4} \sin t$$

$$\therefore y = e^{-2t} (A \cos t + B \sin t) + 0.75 (-\cos t + \sin t)$$

where $C.I. = C.I. + P.I.$

ii) Eliminating C.I.

$$y = 0.75 (-\cos t + \sin t)$$

$$\therefore y = -0.75 (\cos t - \sin t)$$

from $0^\circ + 270^\circ$

iii) Therefore the steady state value =

$$2) EI \frac{d^3y}{dx^3} = \frac{w}{2}(L-x)^2$$

$$EI \frac{d^2y}{dx^2} = 0$$

$$EI m^2 = 0$$

$$\therefore m^2 = 0/EI$$

$$m = \sqrt{0}$$

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

$$CI: y = (A+Bx)$$

$$\therefore I^4 y = Cx^4 + dx^3 + ex^2$$

$$\frac{d^4y}{dx^4} = 4Cx^3 + 3dx^2 + 2ex$$

$$\frac{d^3y}{dx^3} = 12Cx^2 + 6dx + 2e$$

$$\therefore EI [12Cx^2 + 6dx + 2e] = \frac{w}{2}(L^2 - 2Lx + x^2)$$

\therefore Comparing the Coefficients

$$EI 2e = \frac{wx^2}{2}$$

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

$$4EI$$

$$EI 6d = \frac{-wxL}{1}$$

$$1$$

$$d = \frac{-wL}{6EI}$$

$$6EI$$

$$EI 12C \frac{x^2}{2} = \frac{wx^3}{2}$$

$$2$$

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

$$24EI$$

$$\therefore P.I = \frac{w}{24EI} x^4 + \frac{wl}{6EI} x^3 + \frac{wl^2}{4EI} x^2$$

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

$$= \frac{w}{24EI} [x^4 - 4lx^3 + 6l^2x^2]$$

Since $Q.S = C.I + P.I$

$$Q.S: y = (A + Bx) + \frac{w}{24EI} (x^4 - 4lx^3 + 6l^2x^2)$$

at $y=0$ $x=0$

$$0 = A + 0 + \frac{w}{24EI} (0 - 0 + 0)$$

$$A = 0$$

$$\frac{dy}{dx} = B + \frac{w}{24EI} (4x^3 - 12lx^2 + 12l^2x)$$

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

$$0 = B + \frac{w}{24EI} (0)$$

$$\therefore B = 0$$

$$y = (0 + 0x) + \frac{w}{24EI} (x^4 - 4lx^3 + 6l^2x^2)$$

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

∴ Assuming $x = l$

$$y = \frac{w}{24EI} [l^4 - 4l \cdot l^3 + 6l^2 \cdot l^2]$$

$$y = \frac{w}{24EI} [l^4 - 4l^4 + 6l^4]$$

$$y = \frac{w}{24EI} [3l^4]$$

$$y = \frac{3wL^4}{24EI}$$

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

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Clipboard Font Alignment Number

Calibri 11 A A

Wrap Text

General

Conditional Formatting as Table Styles

Format Cell Styles

Insert Delete Cells

B1 $f_x = -0.75*(\cos(A1)-\sin(A1))$

	A	B	C	D	E	F	G	H	I	J	K	L	M	N
1	0	-0.75												
2	10	0.221287814												
3	20	0.378647392												
4	30	-0.856712305												
5	40	1.059038417												
6	50	-0.920505662												
7	60	0.485701769												
8	70	0.105428609												
9	80	-0.662626058												
10	90	1.00655271												
11	100	-1.026513385												
12	110	0.716083601												
13	120	-0.17517734												
14	130	-0.422110965												
15	140	0.883539925												
16	150	-1.060595427												
17	160	0.896290928												
18	170	-0.443508972												
19	180	-0.152019425												
20	190	0.698619315												
21	200	-1.020363729												
22	210	1.013696994												
23	220	-0.680764844												
24	230	0.128723803												
25	240	0.464747887												

