

$$= \frac{3\sqrt{4}}{4} = 3 \tan \theta$$

$$-3 = 3 \tan \theta$$

$$-1 = \tan \theta$$

$$\theta = \tan^{-1}[-1]$$

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Assignment 2.

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

$$4\delta - 4(-\delta) = 6$$

$$4\delta + 4\delta = 6$$

$$8\delta = 6$$

$$\delta = \frac{6}{8} = \frac{3}{4}$$

$$\therefore C = -3/4$$

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

$$m = \frac{-6 \pm \sqrt{6^2 - 4 \times 5}}{2 \times 1}$$

$$= \frac{-4 \pm \sqrt{4^2 - 4(1 \cdot 5)}}{2(1)}$$

$$\text{P.E } y = \frac{-3}{4} \cos\theta + \frac{3}{4} \sin\theta$$

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

∴

$$y = e^{-2\theta}(A \cos\theta + B \sin\theta) - \frac{3}{4} \cos\theta + \frac{3}{4} \sin\theta$$

Comparing with $\alpha \pm j\beta$; $\alpha = -2, \beta = 1$
 $y = e^{-2\theta}(A \cos\theta + B \sin\theta)$

At steady state $\theta = \omega$ $\frac{dy}{d\theta} = 0$

$$\text{P.I } y = (\cos\theta + \delta \sin\theta)$$

$$\frac{dy}{d\theta} = \frac{d(y)}{d\theta}$$

$$\frac{dy}{d\theta} = -\cos\theta + \delta \cos\theta$$

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

$$u = e^{-2\theta} \quad v = A \cos\theta + B \sin\theta$$

$$\frac{du}{d\theta} = -2e^{-2\theta} \quad \frac{dv}{d\theta} = -A \sin\theta + B \cos\theta$$

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

$$e^{2\theta}(-A \sin\theta + B \cos\theta) + (A \cos\theta + B \sin\theta) - 2e^{-2\theta}$$

$$-\cos\theta - \delta \sin\theta - 4\cos\theta + 4\delta \cos\theta + 5\cos\theta + 5\delta \sin\theta = 6\sin\theta$$

$$\frac{dy}{d\theta} = e^{-2\theta}(-A \sin\theta + B \cos\theta) + (A \cos\theta + B \sin\theta)(-2e^{-2\theta})$$

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

$$+ \frac{3}{4} \sin\theta + \frac{3}{4} \cos\theta$$

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

$$\theta = \omega \quad \frac{dy}{d\theta} = 0$$

Compare RHS & LHS

$$4\delta + 4\delta = 0 \dots (1)$$

$$4\delta - 4\delta = 6 \dots (2)$$

$$0 = \frac{3}{4} \sin\theta + \frac{3}{4} \cos\theta$$

from (1)

$$0 = \frac{3}{4} \tan\theta + \frac{3}{4}$$

$$4\delta = 0$$

$$C = -\delta$$

$$-3/4 = 3/4 \tan\theta$$