

Question 2

The angular velocity of the motor is not fixed, but varies with time. The angular velocity of the motor is given by:

$$\omega(t) = \omega_0 + \Delta\omega \sin(\omega_v t)$$

where ω_0 is the angular velocity of the motor at $t = 0$.

Given values:

- $\varphi = 5^\circ$
- $\delta = 2.5^\circ$
- $\omega_0 = 400\pi \text{ rad/s}$
- $\Delta\omega = 10\pi \text{ rad/s}$
- $\omega_v = 2\pi \text{ rad/s}$

Finding magnitude of the angular velocity:

Since there is only one slot, and the Detector only detects the leading edge of the slot, the angular velocity of the motor is given by:

$$\omega(t) = \frac{2\pi}{T}$$

Determining the direction of rotation:

- if the Detector A leads Detector B then the motor is rotating in the clockwise direction.
- if the Detector B leads Detector A then the motor is rotating in the anti-clockwise direction.