

Problem 7.7

A machine part goes from .06 rad/sec to 2.2 rad/sec under the influence of an acceleration of .78 rad/sec/sec.

a.) Determine the angular displacement during the acceleration.

b.) How will net angular displacement change if the angular velocity quantities are doubled?

1.)

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a.) Determine the angular displacement during the acceleration.

$$\begin{aligned}\omega_2^2 &= \omega_1^2 + 2\alpha\Delta\theta \\ \Rightarrow \Delta\theta &= \frac{\omega_2^2 - \omega_1^2}{2\alpha} \\ \Rightarrow &= \frac{(2.2 \text{ rad/sec})^2 - (.06 \text{ rad/sec})^2}{2(.78 \text{ rad/sec}^2)} \\ \Rightarrow &= 3.1 \text{ rad}\end{aligned}$$

b.) How will net angular displacement change if the angular velocity quantities are doubled?

The angular displacement should go up by a factor of 4 as the angular velocity quantities are squared in the kinematic relationship.

2.)