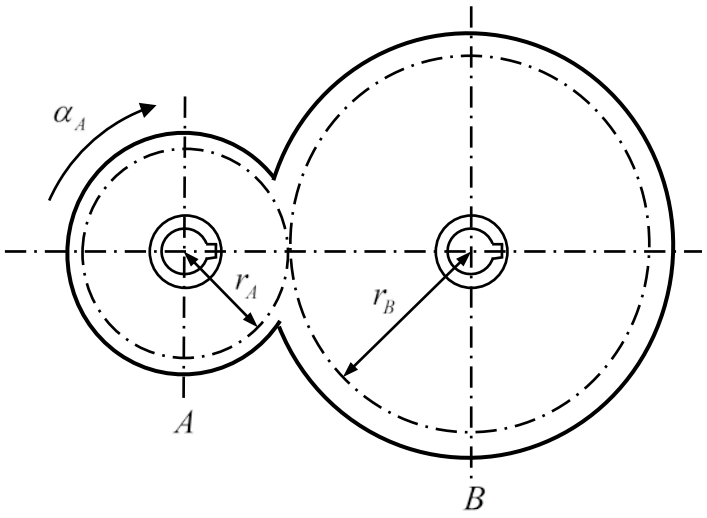
3-11. Gear A starts from rest with a normally distributed angular acceleration $\alpha_A \sim N(2, 0.2^2)$ rad/s^2. If $r_A = 0.4$ m and $r_B = 1$ m, determine the angular velocity and angular displacement of gear B when $t = 4$ s.



$$\omega = \omega_0 + \alpha t,\ \omega_A = 0 + \alpha_A t$$

$$\theta = \theta_0 + \omega_0 t + \frac{1}{2}\alpha t^2,\ \theta_A = 0 + 0 + \frac{1}{2}\alpha_A t^2$$

$$\omega_A r_A = \omega_B r_B,\ \omega_B = \frac{\omega_A r_A}{r_B} = \frac{\alpha_A t r_A}{r_B}$$

$$\mu_{\omega_B} = \frac{\mu_{\alpha_A} t r_A}{r_B} = \frac{2(4)(0.4)}{1} = 3.2 \text{ rad/s}$$

$$\sigma_{\omega_B} = \frac{\sigma_{\alpha_A} t r_A}{r_B} = \frac{0.2(4)(0.4)}{1} = 0.32 \text{ rad/s}$$

$$\theta_A r_A = \theta_B r_B,\ \theta_B = \frac{\theta_A r_A}{r_B} = \frac{\alpha_A t^2 r_A}{2 r_B}$$

$$\mu_{\theta_B} = \frac{\mu_{\alpha_A} t^2 r_A}{2 r_B} = \frac{2(4)^2(0.4)}{2(1)} = 6.4 \text{ rad}$$

$$\sigma_{\theta_B} = \frac{\sigma_{\alpha_A} t^2 r_A}{2 r_B} = \frac{0.2(4)^2(0.4)}{2(1)} = 0.64 \text{ rad}$$

Therefore, $\omega_B \sim N(3.2, 0.32^2)$ rad/s, $\theta_B \sim N(6.4, 0.64^2)$ rad. **Ans.**