

**4.69. Visualize:** Please refer to Figure P4.69.

**Solve:** Since  $\omega_f = \omega_i + (\text{area under } \alpha \text{ vs } t \text{ curve})$ , at  $t = 3 \text{ s}$ , the angular velocity is

$$\begin{aligned}\omega_f &= 60 \text{ rpm} + (4.0 \text{ rad/s}^2)(2 \text{ s} - 1 \text{ s}) \\ &= 60 \text{ rpm} + (4 \text{ rad/s})\left(\frac{20 \text{ rev}}{2\pi \text{ rad}} \times \frac{60 \text{ s}}{1 \text{ min}}\right) \\ &= 60 \text{ rpm} + 38 \text{ rpm} = 98 \text{ rpm}\end{aligned}$$