12. We assume the sense of rotation is positive, which (since it starts from rest) means all quantities (angular displacements, accelerations, etc.) are positive-valued.

(a) The angular acceleration satisfies Eq. 11-13:

$$25\,\text{rad} = \frac{1}{2}\alpha(5.0\,\text{s})^2 \implies \alpha = 2.0\ \text{rad/s}^2\ .$$

(b) The average angular velocity is given by Eq. 11-5:

$$\omega_{\text{avg}} = \frac{\Delta\theta}{\Delta t} = \frac{25\,\text{rad}}{5.0\,\text{s}} = 5.0\ \text{rad/s}\ .$$

(c) Using Eq. 11-12, the instantaneous angular velocity at $t = 5.0$ s is

$$\omega = \left(2.0\,\text{rad/s}^2\right)(5.0\,\text{s}) = 10\ \text{rad/s}\ .$$

(d) According to Eq. 11-13, the angular displacement at $t = 10$ s is

$$\theta = \omega_0 + \frac{1}{2}\alpha t^2 = 0 + \frac{1}{2}(2.0)(10)^2 = 100\ \text{rad}\ .$$

Thus, the displacement between $t = 5$ s and $t = 10$ s is $\Delta\theta = 100 - 25 = 75$ rad.