

30. Since the belt does not slip, a point on the rim of wheel C has the same tangential acceleration as a point on the rim of wheel A . This means that $\alpha_A r_A = \alpha_C r_C$, where α_A is the angular acceleration of wheel A and α_C is the angular acceleration of wheel C . Thus,

$$\alpha_C = \left(\frac{r_A}{r_C} \right) \alpha_A = \left(\frac{10 \text{ cm}}{25 \text{ cm}} \right) (1.6 \text{ rad/s}^2) = 0.64 \text{ rad/s}^2.$$

Since the angular speed of wheel C is given by $\omega_C = \alpha_C t$, the time for it to reach an angular speed of $\omega = 100 \text{ rev/min} = 10.5 \text{ rad/s}$ starting from rest is

$$t = \frac{\omega_C}{\alpha_C} = \frac{10.5 \text{ rad/s}}{0.64 \text{ rad/s}^2} = 16 \text{ s}.$$