Problem:

Starting at rest t=0,a wheel undergoes a constant angular acceleration .when t=2.33sec, the angular velocity of a wheel is 4.96rad/s.the acceleration continues until t=23.0s,when it abruptly ceases. Through what angle does the wheel rotate in the interval t=0 to t=46.0s?

Solution:

According to kinematics of angular movement:

$$\beta = \frac{\omega_1}{t_1} = \frac{4.96}{2.33} = 2.13\ [\frac{rad}{s^2}]$$

$$\omega_2 = \beta t_2 = \omega_1 \frac{t_2}{t_1} = 4.96 * \frac{23}{2.33} = 49\ [rad/s]$$

$$\varphi = \varphi_{t_2} + \omega_2(t_3 - t_2) = \frac{\beta {t_2}^2}{2} + \omega_2(t_3 - t_2) = \frac{\omega_1}{t_1} * \frac{{t_2}^2}{2} + \omega_2(t_3 - t_2)$$
$$= 2.13 * \frac{23^2}{2} + 49 * (46 - 23) = 1690\ [rad]$$

Where β – angular acceleration;

$\omega_1 = 4.96$ rad/s – angular speed at time $t_1 = 2.33\ s$;

ω_1 – angular speed at time $t_2 = 23\ s$;

$t_3 = 46\ s$ – stop time;

φ – whole angle, that wheel rotate through time t_3;

φ_{t_2} – angle, that wheel rotate through time t_2;

Answer: $\varphi = 1690\ [rad]$.