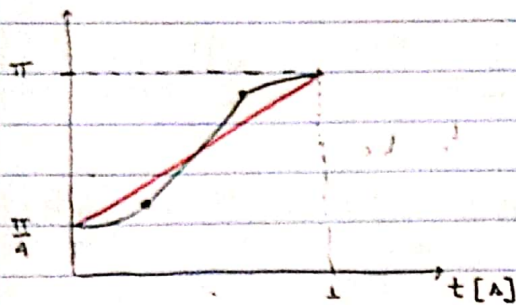


EX 5



$$t_b = \frac{t_f}{2} \pm \sqrt{\frac{t_f^2}{4} - \frac{(\theta_f - \theta_i)}{\ddot{\theta}}}$$

$$V_{\text{linear}} = v_0 + at_b \Leftrightarrow V(t_b) = \ddot{\theta} t_b \Leftrightarrow \ddot{\theta} = \frac{\pi}{t_b}$$

$\nearrow \pi \text{ rad/s}$

$$t_b = \frac{t_f}{2} \pm \sqrt{\frac{t_f^2}{4} - \frac{(\theta_f - \theta_i)}{\ddot{\theta}}}$$

$$\left(t_b - \frac{t_f}{2}\right)^2 = \frac{t_f^2}{4} - \frac{(\theta_f - \theta_i)}{\ddot{\theta}} \cdot t_b$$

$$\left(t_b - \frac{t_f}{2}\right)^2 = 0,25 - 0,75 t_b$$

$$t_b^2 - t_b + 0,25 = 0,25 - 0,75 t_b$$

$$t_b^2 - 0,25 t_b = 0 \rightarrow t_b(t_b - 0,25) = 0 \begin{cases} t_b = 0 \\ t_b = 0,25 \end{cases}$$

$$\ddot{\theta} = \frac{\pi}{0,25} \rightarrow \ddot{\theta} = 4\pi \rightarrow \boxed{\ddot{\theta} = 12,56 \text{ rad/s}^2}$$

$$t_c = 1 - 0,25 \Rightarrow t_c = 0,75$$

$$t_{\text{linear}} = t_c - t_b \Rightarrow \boxed{t_{\text{linear}} = 0,5 \text{ s}}$$

$$b) \ddot{\theta} = \frac{\pi}{2} \text{ rad/s}^2$$

$$t_f = \sqrt{\frac{4(\theta_f - \theta_0)}{\ddot{\theta}}} \Rightarrow t_f = \sqrt{\frac{4(\pi - \pi/4)}{\pi/2}} \Rightarrow \boxed{t_f = 2,45 \text{ s}}$$

$$\vartheta_{\max} = \frac{2(\theta_f - \theta_0)}{t_f} \Rightarrow \vartheta_{\max} = \frac{2(3\pi/4)}{2,45} \Rightarrow \boxed{\vartheta_{\max} = 1,921 \text{ rad/s}}$$

$$\boxed{t_b = 0,25}$$

$$c) a_1 = 0$$

$$a_2 = \frac{3}{2,4452} \cdot (\pi - \pi/4) = 1,1786$$

$$a_3 = \frac{-2}{2,4452} \cdot (\pi - \pi/4) = -0,3208$$

$$\dot{\theta}(t_f) = a_1 + 2a_2 t_f + 3a_3 t_f^2$$

$$\dot{\theta}(t_f) = 2,357 t_f - 0,9624 t_f^2 \rightarrow \boxed{\dot{\theta}(t_f) = 0}$$

$$\boxed{t_f = 1,225 \text{ s}}$$

$$\dot{\theta}_{\max}(1,229) = 1,4615 \text{ rad/s}$$

$$\ddot{\theta}_{\max}(t=0) = 2,357 \text{ rad/s}^2$$