

MEKANİZMA TEKNİĞİ (5. Hafta)

Örnek 2

Örnek

①

Kinematik Analiz

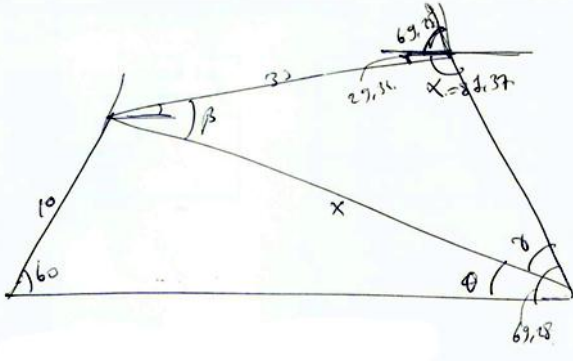
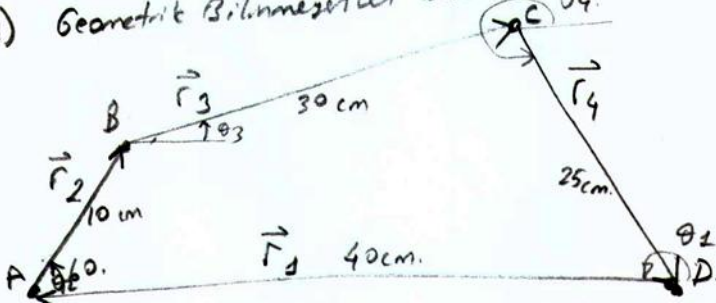
AB = 10 cm.
 BC = 30 cm.
 CD = 25 cm.
 AD = 40 cm.

$\theta_2 = 60^\circ$
 $\omega_2 = 15 \text{ rad/s}$ (\uparrow)

$\omega_3, \omega_4, \alpha_3, \alpha_4 = ?$

2 numaralı şubükle deşerdemistir.
 3 ve 4 numaralı şubüklerin eđitlik merkezi tam ortadadır.

4) Geometrik Bilinmezleri Bulalım. θ_4 .



$$x^2 = 10^2 + 40^2 - 2 \cdot 10 \cdot 40 \cdot \cos 60$$

$$x = 36$$

$$36^2 = 30^2 + 25^2 - 2 \cdot 30 \cdot 25 \cdot \cos \alpha$$

$$\alpha = 82,37^\circ$$

$$\frac{36}{\sin 82,37} = \frac{25}{\sin \beta} \Rightarrow \beta = 43,3^\circ$$

$$\gamma = 180 - (43,3 + 82,37)$$

$$\gamma = 54,33^\circ$$

$$\frac{36}{\sin 60} = \frac{10}{\sin \theta} \Rightarrow \theta = 13,9^\circ$$

}

$\theta_4 \approx 290$

$\theta_3 \approx 30$

② Korum denklemi: $\vec{r}_1 + \vec{r}_2 + \vec{r}_3 + \vec{r}_4 = 0$ ③

$$r_1 \mu(\theta_1) + r_2 \mu(\theta_2) + r_3 \mu(\theta_3) + r_4 \mu(\theta_4) = 0.$$

$\theta_3 = 30^\circ$ $\theta_4 = 290^\circ$ geometrik yolla bulduk.
 $\theta_1 = 180^\circ$ $\theta_2 = 60^\circ$ zilyoduk

③ Hz denklemleri oluşturuldu. Değişkenler = $\theta_2, \theta_3, \theta_4$.
 Sabitler = $r_1, r_2, r_3, r_4, \theta_1$.

$\vec{r}_1 \dot{\theta}_1$ / ~~Sabitler~~ $+ r_2 \cdot \dot{\theta}_2 \cdot \vec{r}(\theta_2) + r_3 \cdot \dot{\theta}_3 \cdot \vec{r}(\theta_3) + r_4 \cdot \dot{\theta}_4 \cdot \vec{r}(\theta_4) = 0.$

$$r_2 \cdot \omega_2 \cdot \sin(\theta_3 - \theta_2) + r_4 \cdot \omega_4 \cdot \sin(\theta_3 - \theta_4) = 0.$$

$$\omega_4 = \frac{-r_2 \cdot \omega_2 \cdot \sin(\theta_3 - \theta_2)}{r_4 \cdot \sin(\theta_3 - \theta_4)} = - \frac{10 \cdot 15 \cdot \sin(30 - 60)}{25 \cdot \sin(30 - 290)}$$

$$\boxed{\omega_4 = 3 \text{ rad/s}} \quad (\uparrow)$$

$\vec{r}_1 \dot{\theta}_1$ / ~~Sabitler~~ $r_2 \cdot \dot{\theta}_2 \cdot \vec{r}(\theta_2) + r_3 \cdot \dot{\theta}_3 \cdot \vec{r}(\theta_3) + r_4 \cdot \dot{\theta}_4 \cdot \vec{r}(\theta_4) = 0.$

$$r_2 \cdot \omega_2 \cdot \sin(\theta_4 - \theta_2) + r_3 \cdot \omega_3 \cdot \sin(\theta_4 - \theta_3) = 0.$$

$$\omega_3 = \frac{-10 \cdot 15 \cdot \sin(290 - 60)}{30 \cdot \sin(290 - 30)} \Rightarrow \boxed{\omega_3 = -3,88 \text{ rad/s}} \quad (\downarrow)$$

(4) İbme Derklemini olustralin.

(4)

$$\cancel{m(\theta_2)} + r_2 \cdot \ddot{\theta}_2 \cdot \vec{r}(\theta_2) - r_2 \cdot \dot{\theta}_2^2 \cdot \vec{\rho}(\theta_2) + r_3 \cdot \ddot{\theta}_3 \cdot \vec{r}(\theta_3) - r_3 \cdot \dot{\theta}_3^2 \cdot \vec{\rho}(\theta_3)$$

$$r_4 \cdot \ddot{\theta}_4 \cdot \vec{r}(\theta_4) - r_4 \cdot \dot{\theta}_4^2 \cdot \vec{\rho}(\theta_4) = 0$$

$$-r_2 \cdot \omega_2^2 \cdot \cos(\theta_3 - \theta_2) - r_3 \cdot \omega_3^2 \cdot 1 + r_4 \cdot \alpha_4 \cdot \sin(\theta_3 - \theta_4)$$

$$-r_4 \cdot \omega_4^2 \cdot \cos(\theta_3 - \theta_4) = 0.$$

$$\alpha_4 = \frac{10 \cdot 15^2 \cdot \cos(30 - 60) + 30 \cdot (-3,88)^2 + 25 \cdot 3^2}{25 \cdot \sin(30 - 290)} \cdot \cos(30 - 290)$$

$\alpha_4 = 95 \text{ rad/s}^2$ ↑
Değerdeley

$m(\theta_4)$

$$-r_2 \cdot \omega_2^2 \cdot \cos(\theta_4 - \theta_2) + r_3 \cdot \alpha_3 \cdot \sin(\theta_4 - \theta_3) - r_3 \cdot \omega_3^2 \cdot \cos(\theta_4 - \theta_3)$$

$$-r_4 \cdot \omega_4^2 = 0.$$

$$\alpha_3 = \frac{25 \cdot 3^2 + 10 \cdot 15^2 \cdot \cos(290 - 60) + 30 \cdot (-3,88)^2 \cdot \cos(290 - 30)}{30 \cdot \sin(290 - 30)}$$

$\alpha_3 = 44 \text{ rad/s}^2$ Değerdeley aynı