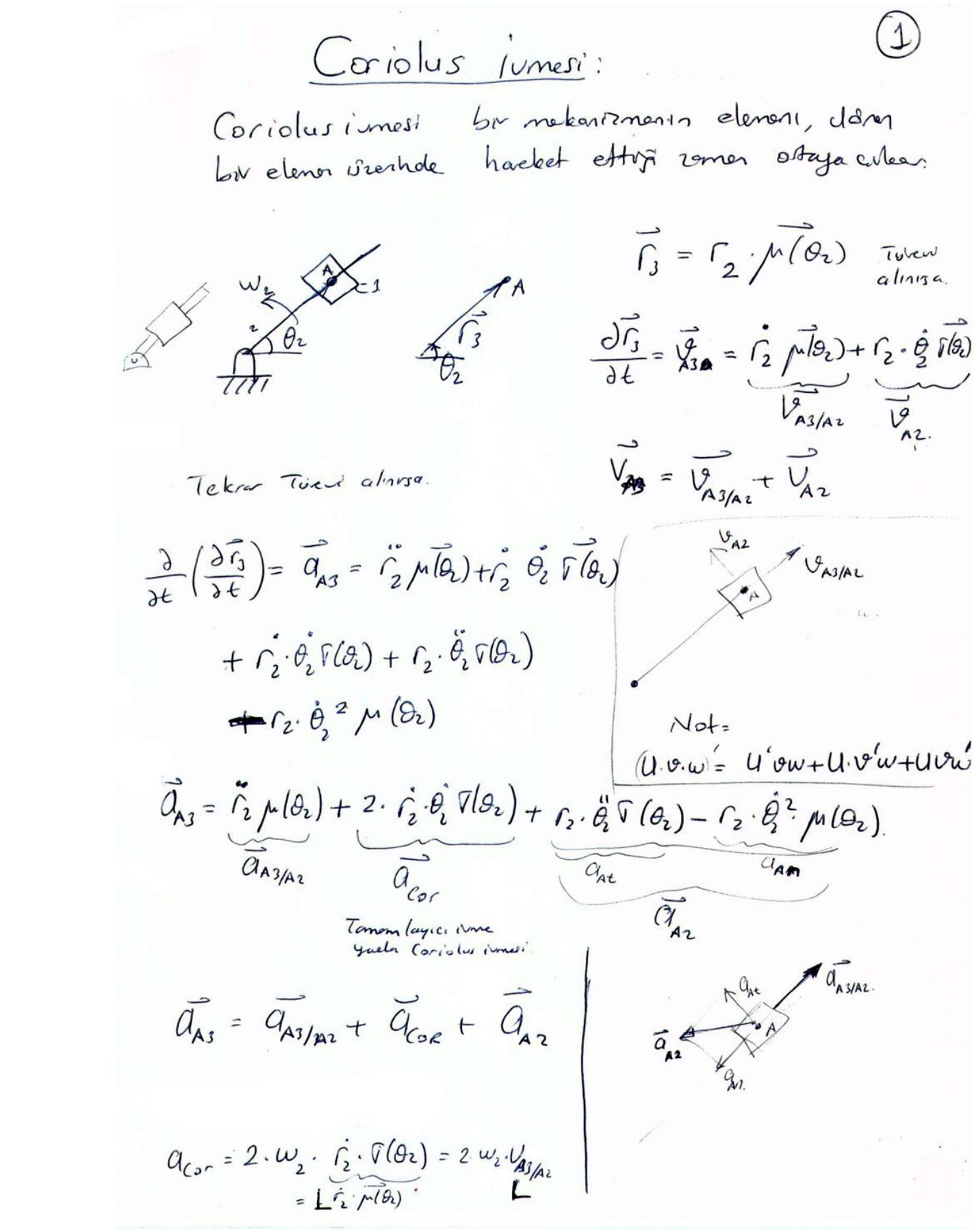
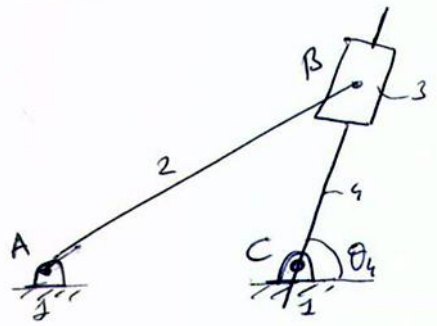
MEKANİZMA TEKNİĞİ (6. Hafta)

Coriolus ivmesi



Örnek 3

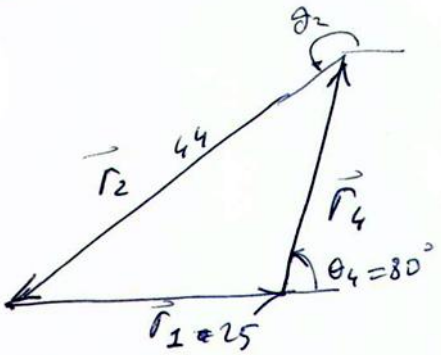
Örnek ②



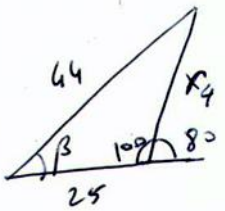
$AC = 25\,cm$.
$AB = 44\,cm$.
$\theta_4 = 80°$
$\omega_4 = 20\ rad/s$ ↻

$a_B = ?$
$\alpha_2 = ?$

① Geometrik Bilinmeyenleri Bulalım.



$\underline{r_1}, \underline{r_2}, \underline{r_4}$
$\underline{\theta_1}, \underline{\theta_2}, \underline{\theta_4}$
? ?



$44^2 = 25^2 + r_4^2 - 2 \cdot 25 \cdot r_4 \cdot \cos 100.$

$r_4^2 + 8,68 \cdot r_4 - 1311 = 0.$

$(r_4)_{1,2} = \dfrac{-b \mp \sqrt{b^2 - 4ac}}{2a} = \dfrac{-8,68 \mp \sqrt{8,68^2 - 4 \cdot 1 \cdot (-1311)}}{2 \cdot 1}$

$(r_4)_{1,2} = \dfrac{-8,68 \mp 78,93}{2} \rightarrow -40,8$
$\rightarrow \underline{35.}$

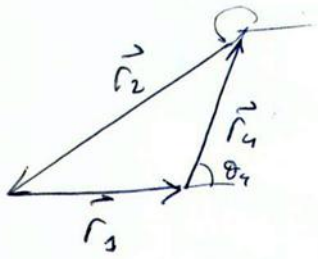
$35^2 = 44^2 + 25^2 - 2 \cdot 44 \cdot 25 \cdot \cos\beta$ $\boxed{r_4 = 35}$

$\boxed{\beta = 52,8}$

$\theta_2 = 180 + 52 = \underline{232°}$. Sağlanır

(3)

2) Konum Denklemini oluşturalım.



$$\vec{r}_1 + \vec{r}_4 + \vec{r}_2 = 0$$

$$r_1 \cdot \mu(\theta_1) + r_4 \cdot \mu(\theta_4) + r_2 \cdot \mu(\theta_2) = 0$$

3) Hız denklemini oluşturalım.

Sabitler: r_1, r_2, θ_1

Değişkenler: θ_4, θ_2, r_4

$$\nabla(\theta_4) \Big/ \quad 0 + \dot{r}_4 \mu(\theta_4) + r_4 \cdot \dot{\theta}_4 \nabla(\theta_4) + r_2 \cdot \dot{\theta}_2 \cdot \nabla(\theta_2) = 0$$

(? ; ?)

$$\dot{r}_4 \mu(\theta_4) \cdot \nabla(\theta_4) + r_4 \cdot \dot{\theta}_4 \cdot \underbrace{\nabla(\theta_4) \cdot \nabla(\theta_4)}_{1} + r_2 \cdot \dot{\theta}_2 \cdot \underbrace{\nabla(\theta_2) \cdot \nabla(\theta_4)}_{\cos(\theta_2 - \theta_4)} = 0$$

$$\dot{\theta}_2 = \omega_2 = \frac{r_4 \cdot \omega_4}{-\cos(\theta_2 - \theta_4)} = -\frac{35 \cdot 20}{\cos(232 - 80)} = 18 \text{ rad/s}$$

$$\boxed{\dot{\theta}_2 = \omega_2 = 18 \text{ rad/s}}$$

$$M(\theta_2) \Big/ \quad \dot{r}_4 \cdot \mu(\theta_4) \cdot M(\theta_2) + r_4 \cdot \dot{\theta}_4 \nabla(\theta_4) \cdot M(\theta_2) + 0 = 0$$

(? ; $\cos(\theta_4 - \theta_2)$; $\sin(\theta_2 - \theta_4)$)

$$\dot{r}_4 = V_{B3/B4} = -\frac{35 \cdot 20 \cdot \sin(232 - 80)}{\cos(80 - 232)} = 420 \text{ cm/s}$$

$$\boxed{\dot{r}_4 = 420 \text{ cm/s}}$$

4) İvme Denklemini oluşturalım. (4)

$$\ddot{r}_4\,\vec{\mu}(\theta_4) + \dot{r}_4\,\dot{\theta}_4\,\vec{r}(\theta_4) + r_4\cdot\dot{\theta}_4\cdot\vec{r}(\theta_4) + r_4\cdot\dot{\theta}_4^2\,\vec{\mu}(\theta_4)$$

$$r_2\cdot\ddot{\theta}_2\,\vec{r}(\theta_2) - r_2\cdot\dot{\theta}_2^2\,\vec{\mu}(\theta_2) = 0.$$

$\vec{r}(\theta_4)$ /

$$2\cdot\dot{r}_4\cdot\dot{\theta}_4\,\vec{r}(\theta_4) + \underbrace{\ddot{r}_4}_{?}\,\vec{\mu}(\theta_4) - r_4\cdot\dot{\theta}_4^2\,\vec{\mu}(\theta_4) + r_2\cdot\underbrace{\ddot{\theta}_2}_{?}\,\vec{r}(\theta_2) - r_2\cdot\dot{\theta}_2^2\,\vec{\mu}(\theta_2) = 0$$

$$2\cdot\dot{r}_4\cdot\omega_4 + r_2\cdot\underbrace{\alpha_2}_{?}\cdot\cos(\theta_2-\theta_4) - r_2\cdot\omega_2^2\cdot\sin(\theta_2-\theta_4) = 0$$

$$\alpha_2 = \frac{44\cdot 18^2\cdot\sin(238-80) - 2\cdot 420\cdot 20}{44\cdot\cos(232-80)}$$

$$\boxed{\alpha_2 = 260\ \text{rad/s}^2}$$

$\vec{\mu}(\theta_2)$ /

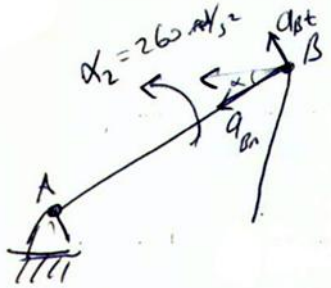
$$2\cdot\dot{r}_4\cdot\dot{\theta}_4\sin(\theta_2-\theta_4) + \underbrace{\ddot{\theta}_4}_{?}\cos(\theta_4-\theta_2) - r_4\cdot\omega_4^2\cdot\cos(\theta_4-\theta_2) + 0$$
$$- r_2\cdot\omega_2^2\cdot 1 = 0.$$

$$\ddot{r}_4 = \frac{35\cdot 20^2\cdot\cos(80-232) + 44\cdot 18^2 - 2\cdot 420\cdot 20\cdot\sin(232-80)}{\cos(80-232)}$$

$$\ddot{r}_4 = 6786\ \text{cm/s}^2$$

??

(5)



2 nolu elemanın bir ucu mafsallı olduğu için açısal ivmesini bilyasak B noktasının ivmesini kolayca bulabiliriz.

$$a_{Bn} = \omega_2^2 \cdot AB = 18^2 \cdot 44 = 142,56\ m/s^2.$$

$$a_{Bt} = \alpha_2 \cdot AB = 260 \cdot 44 = 114,40\ m/s^2$$

$$a_{B2} = \sqrt{142,56^2 + 114,40^2} = 182,78\ m/s^2.$$

$$\tan\alpha = \frac{a_{Bt}}{a_{Bn}} = \frac{114,40}{142,78} \Rightarrow \alpha = 38^\circ$$