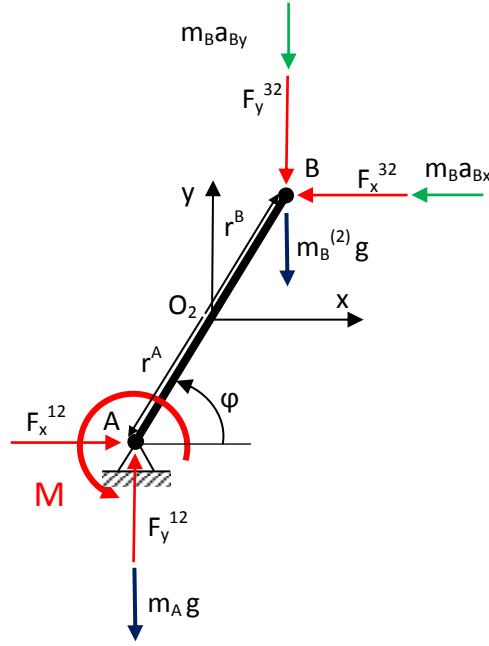
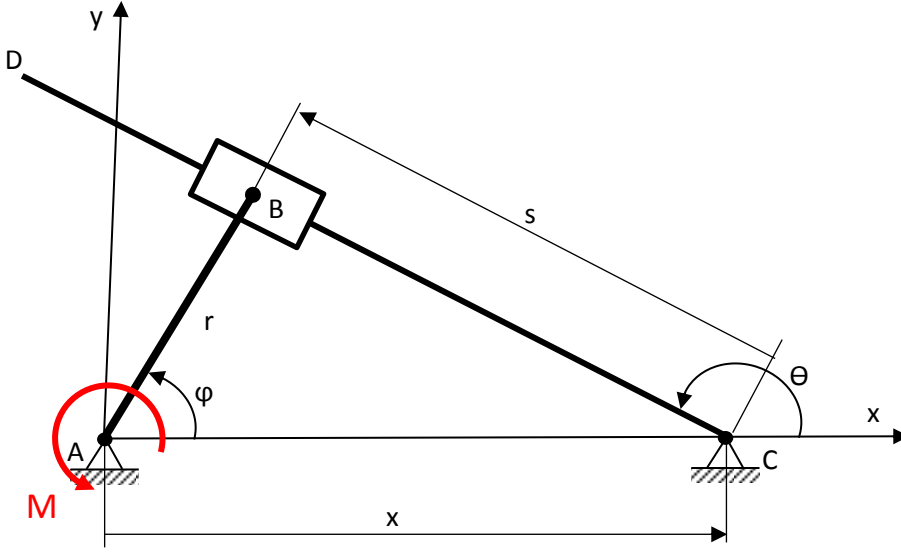


## Kol-kızak Mekanizması Kuvvet Analizi



Buradan 2 no'lu uzvun denge denklemlerini yazalım.

$$\sum F_x = 0 \quad F_x^{12} - F_x^{32} - m_B a_{Bx} = 0$$

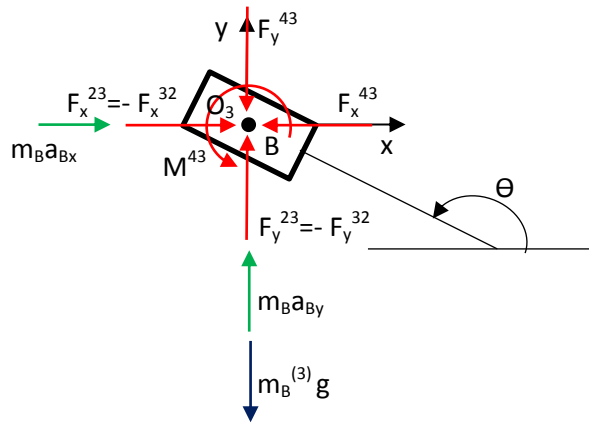
$$\sum F_y = 0 \quad F_y^{12} - F_y^{32} - m_A g - m_B^{(2)} g - m_B a_{By} = 0$$

$$\sum M_{O_2} = 0 \quad F_x^{12} r_y^A + (m_A g - F_y^{12}) r_x^A + (F_x^{32} + m_B a_{Bx}) r_y^B - (F_y^{32} + m_B a_{By} + m_B^{(2)} g) r_x^B + M = 0$$

Burada moment kollarının değeri,

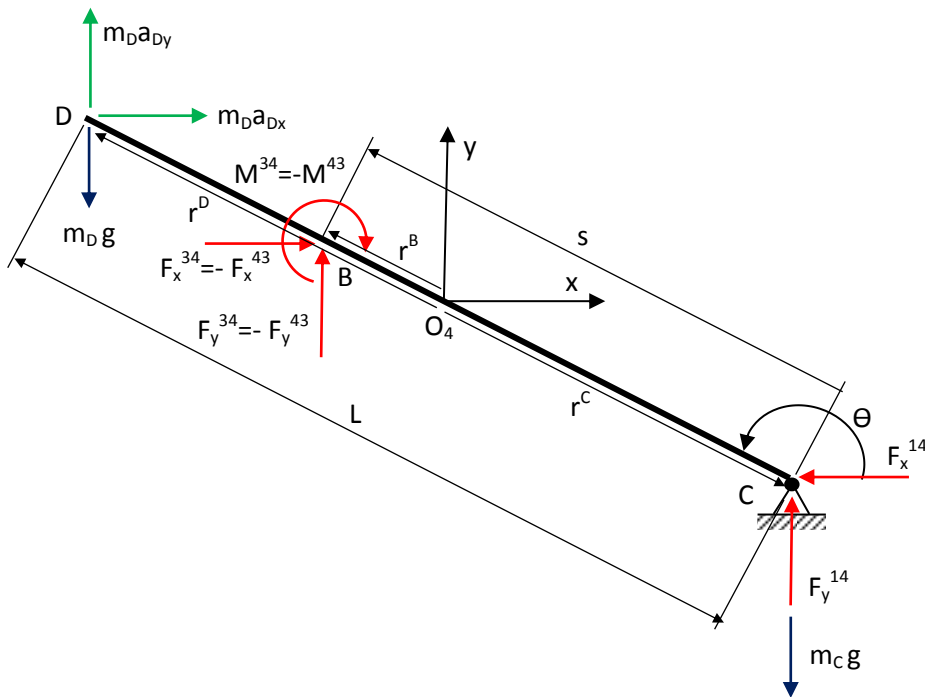
$$r_x^A = \frac{r}{2} \cos \varphi, \quad r_y^A = \frac{r}{2} \sin \varphi, \quad r_x^B = \frac{r}{2} \cos \varphi, \quad r_y^B = \frac{r}{2} \sin \varphi$$

Aynı şekilde 3 no'lu uzvun denge denklemlerini yazalım.



$$\begin{aligned}\sum F_x = 0 & \quad -F_x^{43} - F_x^{32} + m_B a_{Bx} = 0 \\ \sum F_y = 0 & \quad -F_y^{43} - F_y^{32} + m_B a_{By} - m_B^{(3)} g = 0 \\ \sum M_{O_3} = 0 & \quad M^{43} = 0\end{aligned}$$

4 no'lu uzvun denge denklemlerini yazalım.



$$\begin{aligned}\sum F_x = 0 & \quad -F_x^{43} - F_x^{14} + m_D a_{Dx} = 0 \\ \sum F_y = 0 & \quad -F_y^{43} + F_y^{14} + m_D a_{Dy} - m_C g - m_D g = 0 \\ \sum M_{O_4} = 0 & \quad M^{43} - m_D a_{Dx} r_y^D + (m_D g - m_D a_{Dy}) r_x^D + F_x^{43} r_y^B + F_y^{43} r_x^B - F_x^{14} r_y^C + (F_y^{14} - m_C g) r_x^C = 0\end{aligned}$$

Burada moment kollarının değeri,

$$r_x^B = \left(s - \frac{L}{2}\right) \cos \theta, \quad r_y^B = \left(s - \frac{L}{2}\right) \sin \theta, \quad r_x^C = \frac{L}{2} \cos \theta, \quad r_y^C = \frac{L}{2} \sin \theta, \quad r_x^D = \frac{L}{2} \cos \theta, \quad r_y^D = \frac{L}{2} \sin \theta$$

Yukarıdaki denge denklemlerini matris formunda yazalım.

$$\begin{bmatrix}
 1 & -1 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\
 r_y^A & r_y^B & -r_x^A & -r_x^B & 0 & 0 & 0 & 0 & 0 \\
 0 & 0 & 1 & -1 & 0 & 0 & 0 & 0 & 0 \\
 0 & -1 & 0 & 0 & -1 & 0 & 0 & 0 & 0 \\
 0 & 0 & 0 & -1 & 0 & -1 & 0 & 0 & 0 \\
 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 1 \\
 0 & 0 & 0 & 0 & -1 & 0 & -1 & 0 & 0 \\
 0 & 0 & 0 & 0 & 0 & -1 & 0 & 1 & 0 \\
 0 & 0 & 0 & 0 & r_y^B & r_x^B & -r_y^C & r_x^C & 1
 \end{bmatrix}
 \begin{bmatrix}
 F_x^{12} \\
 F_y^{12} \\
 F_x^{32} \\
 F_y^{32} \\
 F_x^{43} \\
 F_y^{43} \\
 F_x^{14} \\
 F_y^{14} \\
 M^{43}
 \end{bmatrix}
 =
 \begin{bmatrix}
 m_B a_{Bx} \\
 -m_A g r_x^A - m_B a_{Bx} r_y^B + (m_B a_{By} + m_B^{(2)} g) r_x^B - M \\
 m_A g + m_B^{(2)} g + m_B a_{By} \\
 -m_B a_{Bx} \\
 -m_B a_{By} + m_B^{(3)} g \\
 0 \\
 -m_D a_{Dx} \\
 -m_D a_{Dy} + m_C g + m_D g \\
 m_D a_{Dx} r_y^D - (m_D g - m_D a_{Dy}) r_x^D + m_C g r_x^C
 \end{bmatrix}$$

