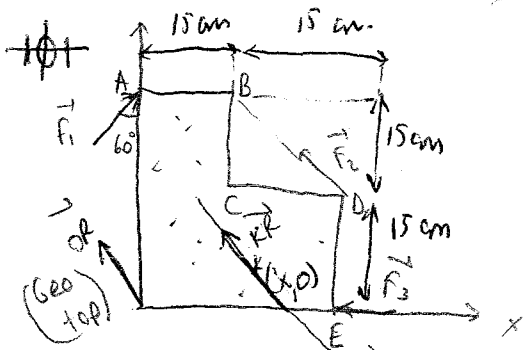




$$\begin{aligned}\vec{F}_1 &= 17,32\vec{i} + 10\vec{j} \\ \vec{F}_2 &= 35,35\vec{i} + 35,35\vec{j} \\ \vec{F}_3 &= -40\vec{j}\end{aligned}$$

$$\vec{OR} = \sum_{i=1}^n \vec{F}_i = -58\vec{i} + 45,35\vec{j}$$

$$\vec{M}_O(S) = (\vec{OA} \wedge \vec{F}_1) + (\vec{OD} \wedge \vec{F}_2) = -519\vec{k} + 1590,75\vec{k} = 1071,15\vec{k}$$

$$b) \vec{OR} \neq 0, \vec{M}_O(S) \neq 0 \quad \vec{OR} \perp \vec{M}_O(S) \Rightarrow \text{bileskeye esd. vek. sist.}$$

$$\vec{KR} = \text{bileske} \quad \vec{M}_K(S) = 0$$

$$\vec{KR} = \vec{OR}$$

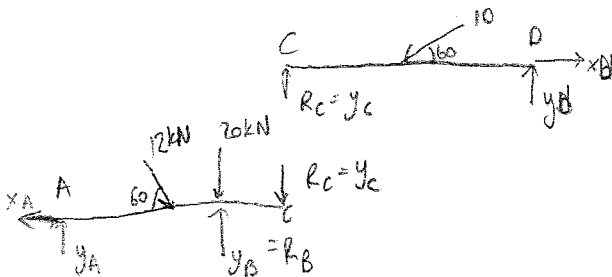
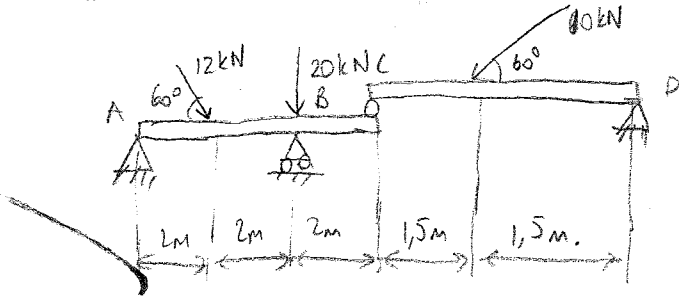
$$\vec{M}_K(S) = \vec{M}_O(S) + \vec{KO} \wedge \vec{OR} \quad (\text{Geçiş teoremi}) \quad \vec{M}_O(S) = \vec{OK} \wedge \vec{KR} \quad (\text{Varignon teo})$$

$$0 = 1071,15\vec{k} + [(-x\vec{i}) \wedge (-58\vec{i} + 45,35\vec{j})] = 0$$

$$1071,15\vec{k} - 43,35x \cdot \vec{k} = 0$$

$$1071,15 - 43,35x = 0 \Rightarrow x = 23,61$$

*



AC için denge denk,

$$4 \sum X = 0 \rightarrow X_A = 12 \cdot \frac{1}{2} = 6 \text{ kN}$$

$$5 \sum Y = 0 \rightarrow Y_C + 20 + \frac{12\sqrt{3}}{2} = Y_A + Y_B$$

$$Y_A + Y_B = 34,72 \text{ kN}$$

Sistem dengededir. Sol git. Mafsal tepkilerini bulunuz.

pin olsa $\rightarrow$ 2 yande tepki alırdık.

CD için denge denk,

$$1 \sum X = 0, \quad X_D = 10 \cdot \frac{1}{2} = 5 \text{ kN}$$

$$2 \sum Y = 0 \\ Y_C + Y_D = \frac{10\sqrt{3}}{2}$$

$$3 \sum M_C = 0$$

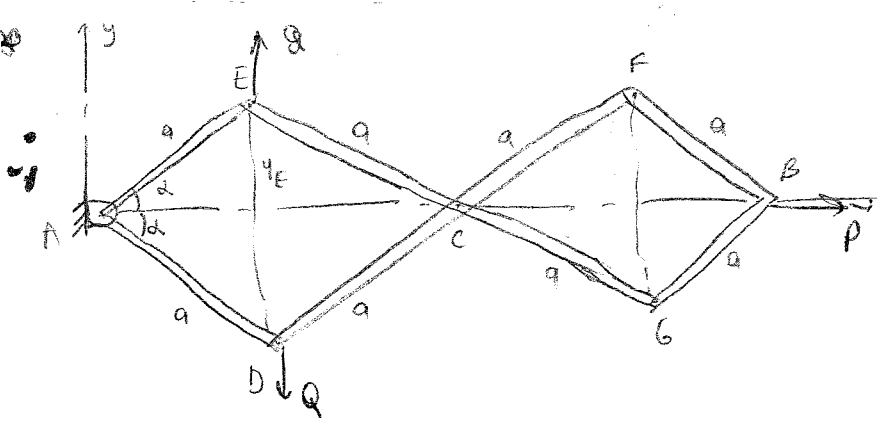
$$5\sqrt{3} \cdot 1,5 = Y_D \cdot 3 \rightarrow \begin{cases} Y_D = 4,33 \text{ kN} \\ Y_C = 4,33 \text{ kN} \end{cases}$$

$$6 \sum M_A = 0$$

$$12 \frac{\sqrt{3}}{2} \cdot 2 + 20 \cdot 6 + 4,33 \cdot 6 = Y_B \cdot 4$$

$$Y_B = 38,69 \text{ kN}$$

$$Y_A = 3,02 \text{ kN}$$



A, E, D, C ve C, F, BG
dörtgenleri birbirlerine
gittikçe eskenar dörtgenler olup,
kenar uzunlukları 'a' dır.
P ve Q arasındaki
bağıntıyı virtual iş prin-
sibinden yararlanarak α
açısını bulunuz.

$$Q, -Q, P$$

$$y_E = a \sin \alpha, \quad dy_E = a \cos \alpha d\alpha$$

$$y_D = -a \sin \alpha, \quad dy_D = -a \cos \alpha d\alpha$$

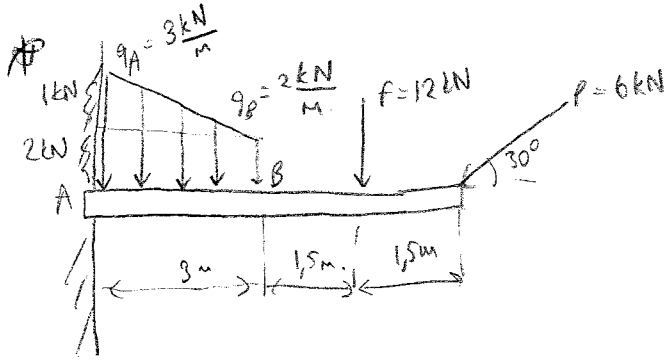
$$x_B = 4a \cos \alpha, \quad dx_B = -4a \sin \alpha d\alpha$$

$$dZ = Q dy_E + Q dy_D + P dx_B = 0$$

$$Q a \cos \alpha d\alpha + Q (-a \cos \alpha d\alpha) - P \cdot 4a \sin \alpha d\alpha = 0$$

$$(2Q \cos \alpha - P \cdot 4 \sin \alpha) d\alpha = 0$$

$$\frac{P}{Q} = \frac{\cot \alpha}{2}, \quad \frac{P}{Q} = 2 \tan \alpha$$



Sekildeki kirisin A noktasından 3m.
uzaklıkta oluşan kesme kuvveti ve
eğilme momenti değerlerini bulunuz.

$$\sum X = 0$$

$$X_A = 6 \cos 30^\circ \quad X_A = 3\sqrt{3} = 5,196 \text{ kN}$$

$$\sum Y = 0$$

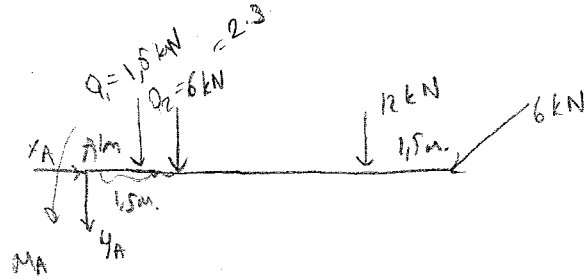
$$1,5 + 6 + 12 + 3 = Y_A$$

$$Y_A = 22,5 \text{ kN}$$

$$\sum M_A(s) = 0$$

$$M_A - 1,5 \cdot 1 - 6 \cdot 1,5 - 12 \cdot 4,5 - 3 \cdot 6 = 0$$

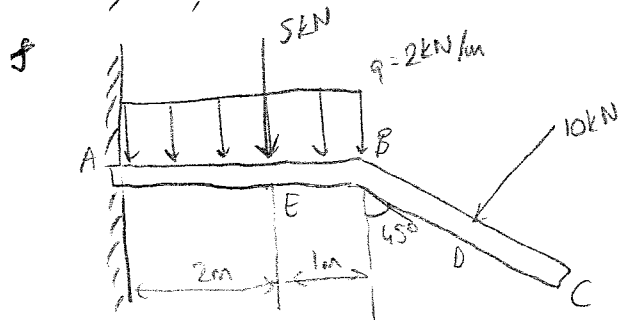
$$M_A = 82,5 \text{ kN}$$



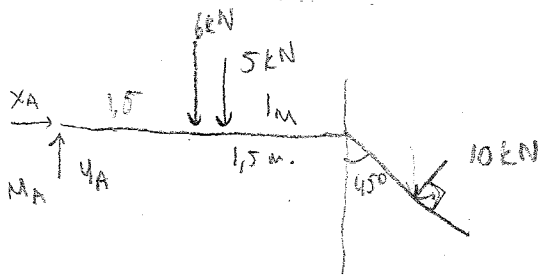
$$x = 3 \text{ m};$$

$$Q = 22,5 - 1,5 - 6 = 15 \text{ kN (kesme kuvveti)}$$

$$M_Q = 82,5 + 1,5 \cdot 2 + 6 \cdot 1,5 - 22,5 \cdot 3 = 27 \text{ kN}$$



Bir ABC çubuğu şekildeki gibi
mesnetlenmiştir. Rijit cisim diyagramını
çiziniz mesnet tepkilerini bulunuz.
 $|BD| = |DC| = 1,5 \text{ m}$.



$$\sum x = 0$$

$$X_A = \frac{10\sqrt{2}}{2} \Rightarrow X_A = 5\sqrt{2}$$

$$\sum y = 0$$

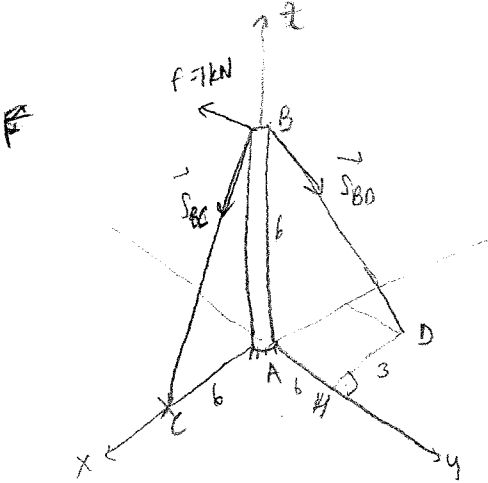
$$10\frac{\sqrt{2}}{2} + 6 + 5 = Y_A$$

$$Y_A = 18,078$$

$$\sum M_A = 0$$

$$M_A = 6 \cdot 1,5 + 5 \cdot 2 + 5\sqrt{2} \left(3 + 1,5\frac{\sqrt{2}}{2} \right) + 5\sqrt{2} \cdot 1,5\frac{\sqrt{2}}{2}$$

$$M_A = 55,21 \text{ kNm}$$



$$\vec{F} // \text{oy}, \quad \begin{aligned} AB &= 6 \text{ m} \\ AC &= 6 \text{ m} \\ AD &= 3 \text{ m} \end{aligned}$$

Şekilde gösterilen direkte BC ve BD kablolarındaki çekme kuvvetlerini, A wresel mafsalındaki tepkileri belirleyiniz. Gözümde tablo kullanınız.

utay st.

$$\{ \vec{F}, \vec{S}_{BC}, \vec{S}_{BD}, \vec{R}_A \} = 0$$

	x	y	z	X	Y	Z	L	M	N
$\vec{F}$	0	0	6	0	-1	0	6	0	0
$\vec{S}_{BC}$	0	0	6	$\frac{S_{BC}}{\sqrt{2}}$	0	$-\frac{S_{BC}}{\sqrt{2}}$	0	$\frac{6S_{BC}}{\sqrt{2}}$	0
$\vec{S}_{BD}$	0	0	6	$-\frac{S_{BD}}{3}$	$\frac{2}{3}S_{BD}$	$-\frac{2}{3}S_{BD}$	$-4S_{BD}$	$-2S_{BD}$	0
$\vec{R}_A$	0	0	0	X_A	Y_A	Z_A	0	0	0
$\sum$				0	0	0	0	0	0

$$\vec{S}_{BD} = S_{BD} \cdot \vec{e}_{BD}$$

$$B(0,0,6)$$

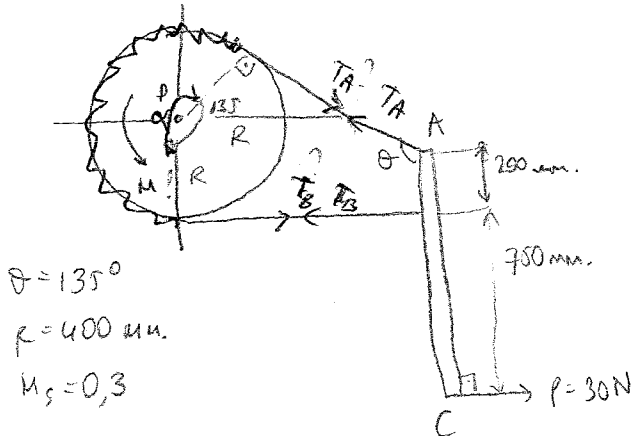
$$D(-3,6,0)$$

$$\vec{e}_{BD} = \frac{\vec{BD}}{|\vec{BD}|}$$

$$= \frac{-3\vec{i} + 6\vec{j} - 6\vec{k}}{\sqrt{3^2 + 6^2 + 6^2}}$$

$$\frac{3}{9} \frac{3}{9} \frac{6}{9} \sqrt{3^2 + 6^2 + 6^2}$$

$$S_{BC} = 0,7 \quad S_{BD} = 1,5 \quad X_A = 0 \quad Y_A = 0, \quad Z_A = 1,5 \text{ kN}$$



$$\theta = 135^\circ$$

$$R = 400 \text{ mm}$$

$$\mu_s = 0,3$$

$$T_A > T_B \text{ amentli karşılamlı}$$

Basit bant frezi, kayış uçları A'da pimle ve B'de manivela koluna bağlı olacak şekilde yapılmıştır. Kola, $P = 30 \text{ N}$ 'luk bir kuvvet uygulandığına göre, bant frezi ile karşı konulabilen döndürme momentini belirle. (Tekvitek D'de pimle bağlı)

$$T_A = T_B$$

$$\alpha = 180 + 45 = \frac{5\pi}{4} \text{ Rad.}$$

$$\frac{T_A}{T_B} = e^{i\alpha} \Rightarrow T_A = e^{i\frac{5\pi}{4}} \cdot T_B$$

$$\sum M_A = 0$$

$$T_B \cdot 200 = P \cdot 950$$

$$T_B = 142,5 \text{ N}$$

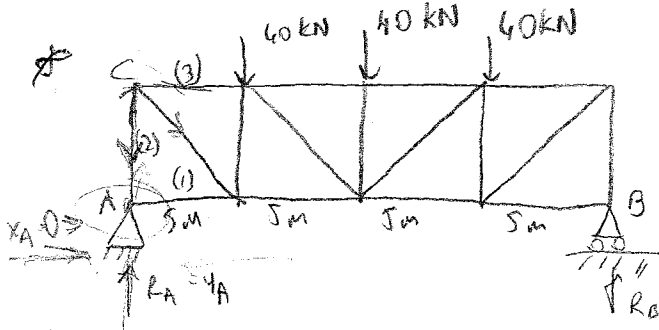
$$T_A = 462,84 \text{ N}$$

$$\sum M_D = 0$$

$$T_A \cdot R = M + T_B \cdot R$$

$$462,84 \cdot 400 = M + 142,5 \cdot 400$$

$$M = 128,136 \text{ Nm}$$



Şekilde görülen kafes sistide 1, 2, 3 nolu üyelerin taşıdığı ekserel kuvvetleri bulunuz.

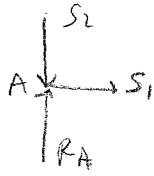
$$\sum Y = 0$$

$$R_A + R_B = 120 \text{ kN}$$

$$\sum M_A = 0$$

$$40 \cdot 5 + 40 \cdot 10 + 40 \cdot 15 = R_B \cdot 20 \quad R_B = R_A = 60 \text{ kN}$$

A düğümü;



$$\sum X = 0$$

$$S_1 = 0$$

$$\sum Y = 0$$

$$S_2 = R_A = 60 \text{ kN}$$

C düğümü;



$$\sum X = 0$$

$$S_4 \frac{\sqrt{2}}{2} = S_3$$

$$\sum Y = 0$$

$$S_2 = S_4 \frac{\sqrt{2}}{2}$$

$$S_4 = \frac{120}{\sqrt{2}} \text{ kN}$$

$$S_3 = 60 \text{ kN}$$