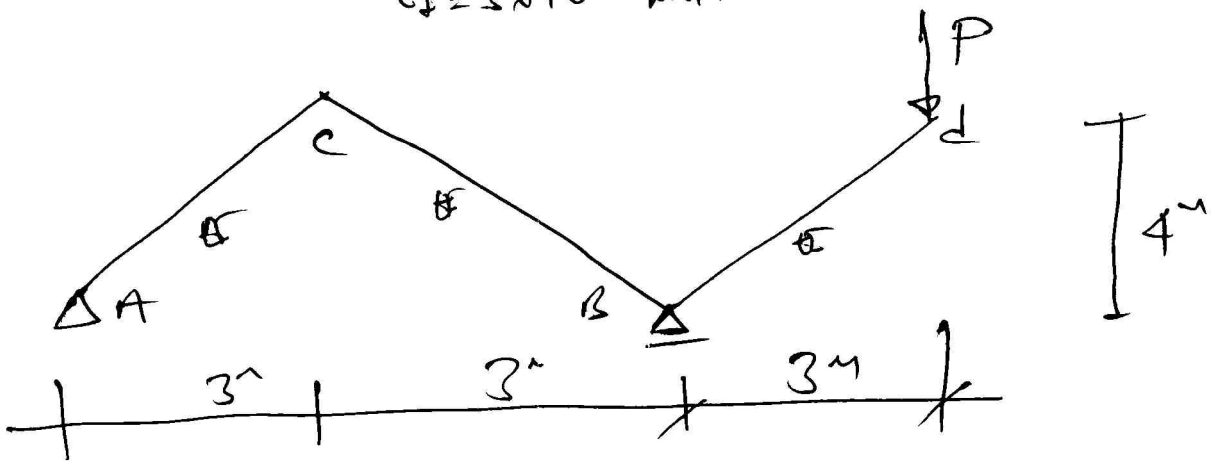
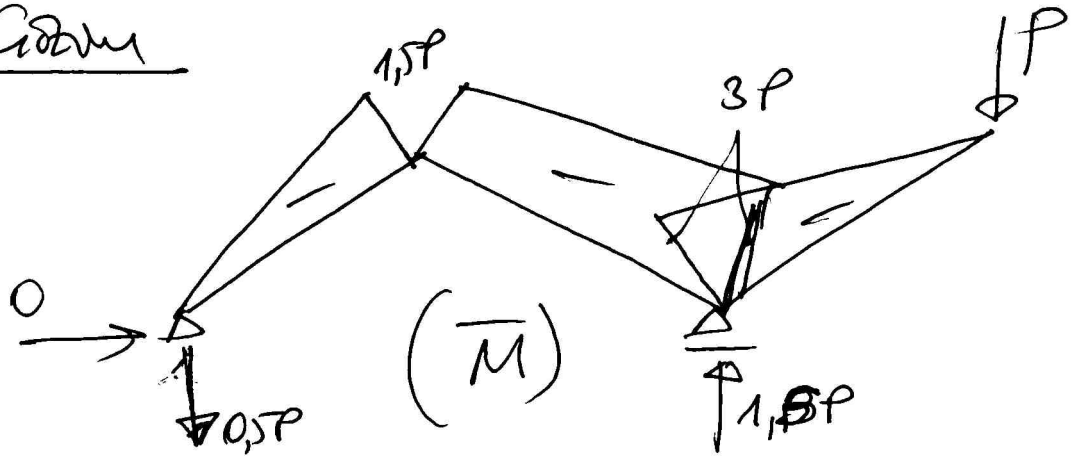
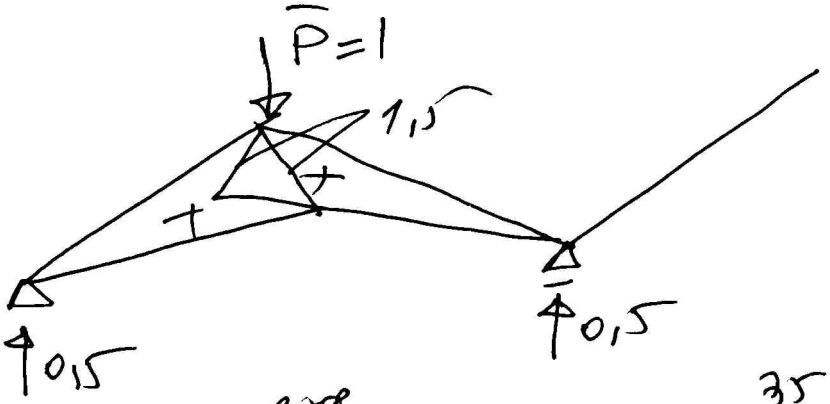
Soru 3) Şekilde verilen sistem C noktasının düşey yer değiştirmesinin en çok 2 cm olması durumunda P yükü en fazla ne kadar olmalıdır?

$EI = 3 \times 10^4 \ kNm^2$



Çözüm

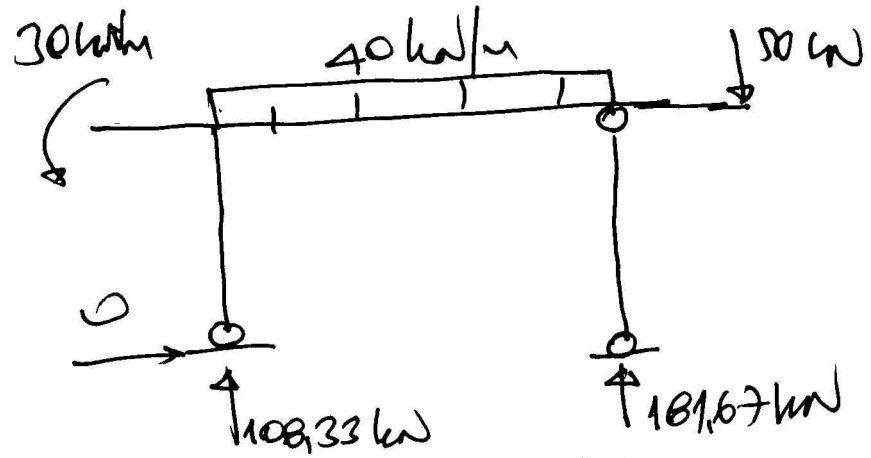


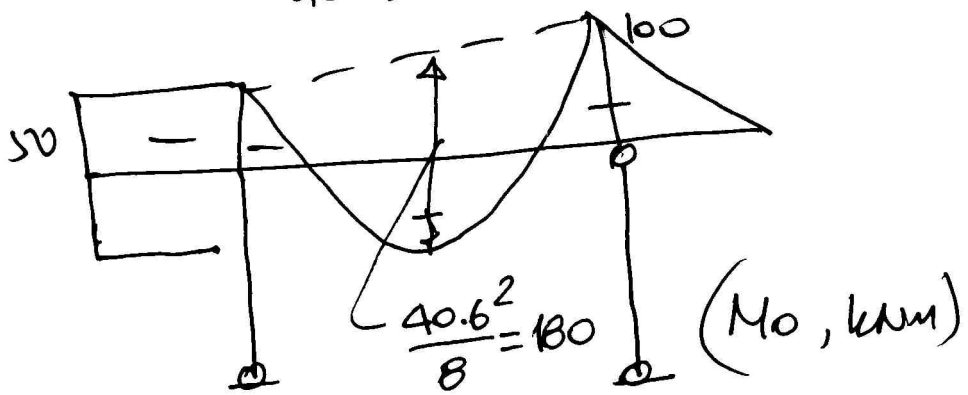


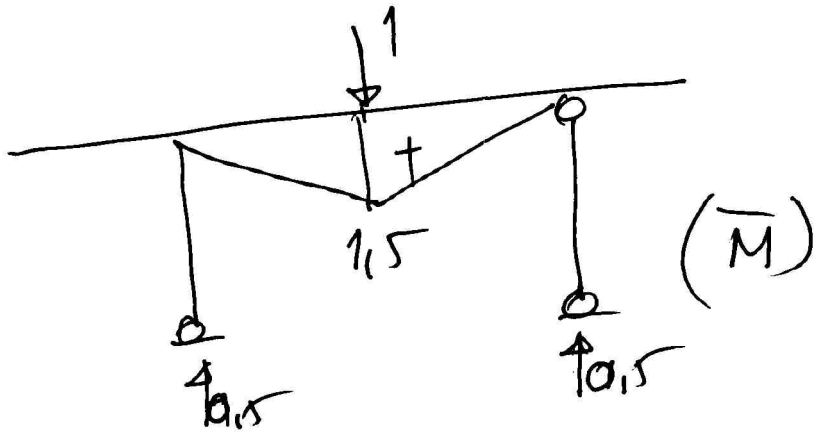
$$\delta_{cy} = \left[\overbrace{\frac{1}{3} \times 5 \times (-1{,}5P)(1{,}5)}^{3{,}375P} + \overbrace{\frac{1}{6} \times 5 \times (1{,}5)(-2 \cdot 1{,}5P - 3P)}^{3{,}5}\right]\frac{1}{EI} = 0{,}02$$

$$-\frac{11{,}25}{EI}P = 0{,}02 \longrightarrow P = 53{,}33 \ kN$$

a)





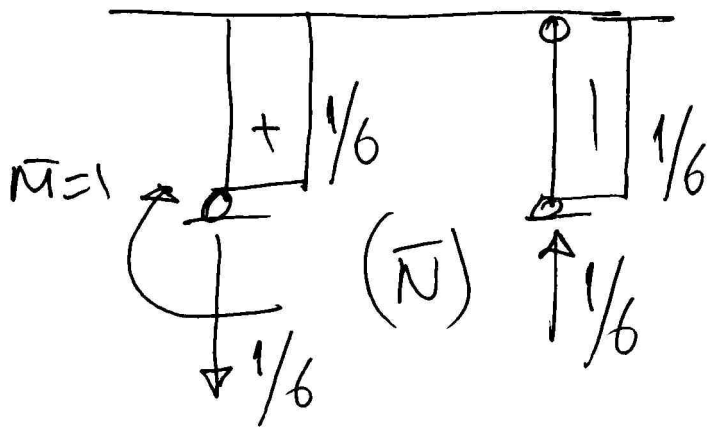


$$\delta_{1y} = \left[\frac{1}{6} \cdot 6 \cdot 1{,}5 \left\{(1+0{,}5)(-50) + (1+0{,}5) \cdot (+100)\right\}\right] \frac{1}{EI}$$

$$+ \left[\frac{1}{3} \cdot 6 \cdot (1 + 0{,}5 \cdot 0{,}5)\, 1{,}5 \cdot 180\right] \frac{1}{EI} = 0{,}01125 \text{ m}$$

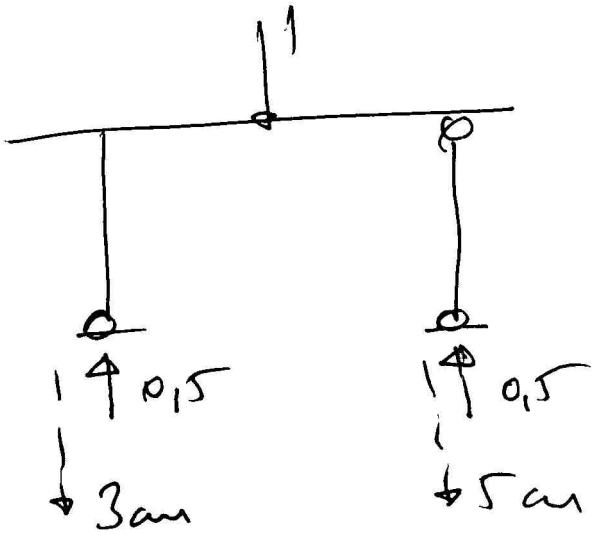
$$= 1{,}125 \text{ cm.}$$

b)



$$\varphi_A = \int \bar{N} \cdot \alpha_t \, dx = 0$$

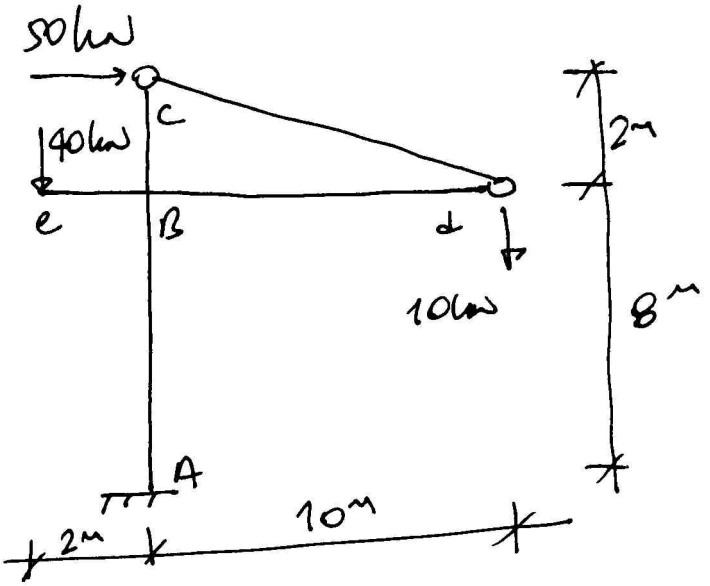
c)

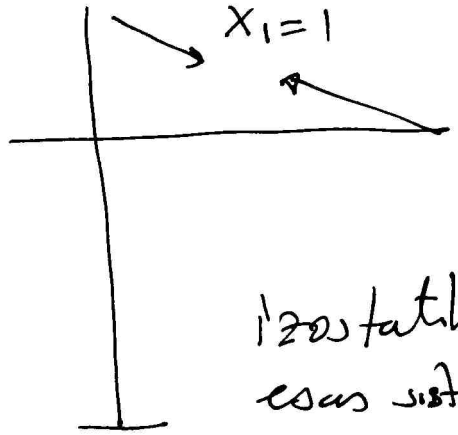


$$\delta_{1y} = 0{,}5 \times 0{,}01 + 0{,}5 \times 0{,}05 = 0{,}04 \text{ m}$$

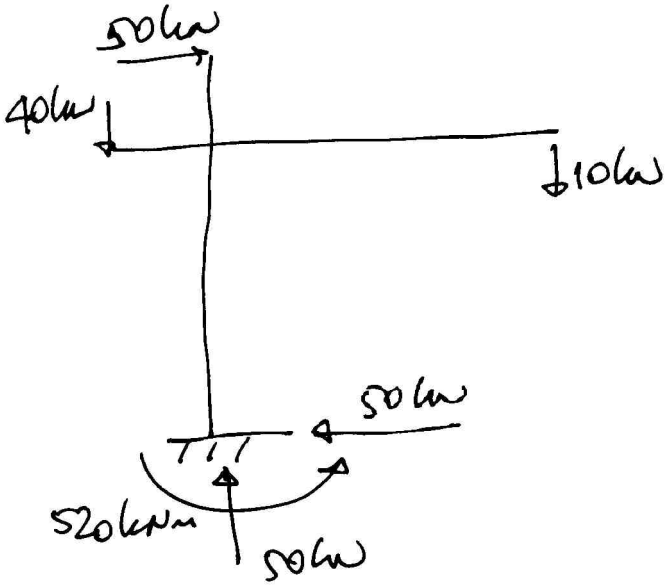
$$= 4 \text{ cm.}$$

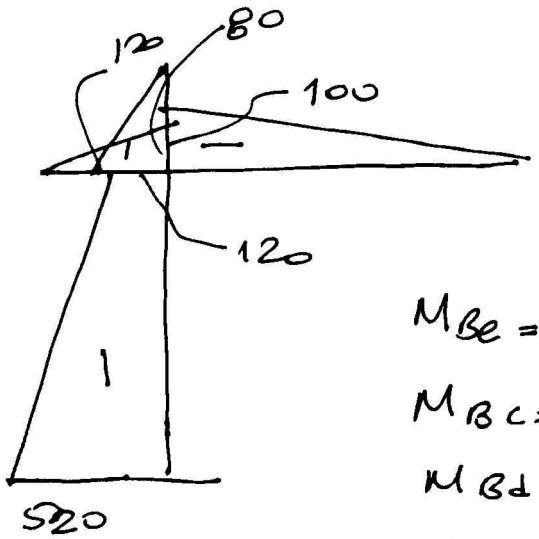
1





izostatik esas sistem





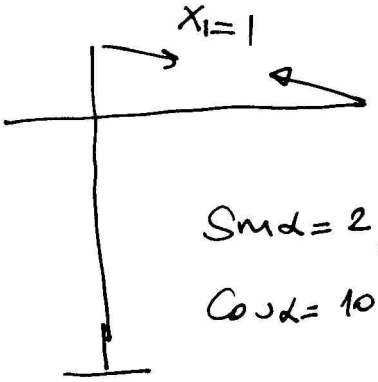
$M_{Be} = -80$ kNm

$M_{BC} = -100$ kNm

$M_{BD} = -100$ kNm

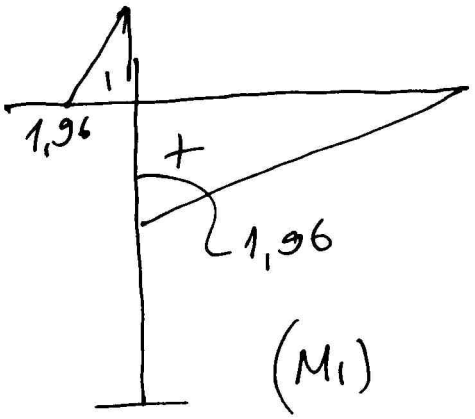
$M_{BA} = -120$ kNm

(M_0)



$\sin\alpha = 2/10{,}26$

$\cos\alpha = 10/10{,}26$



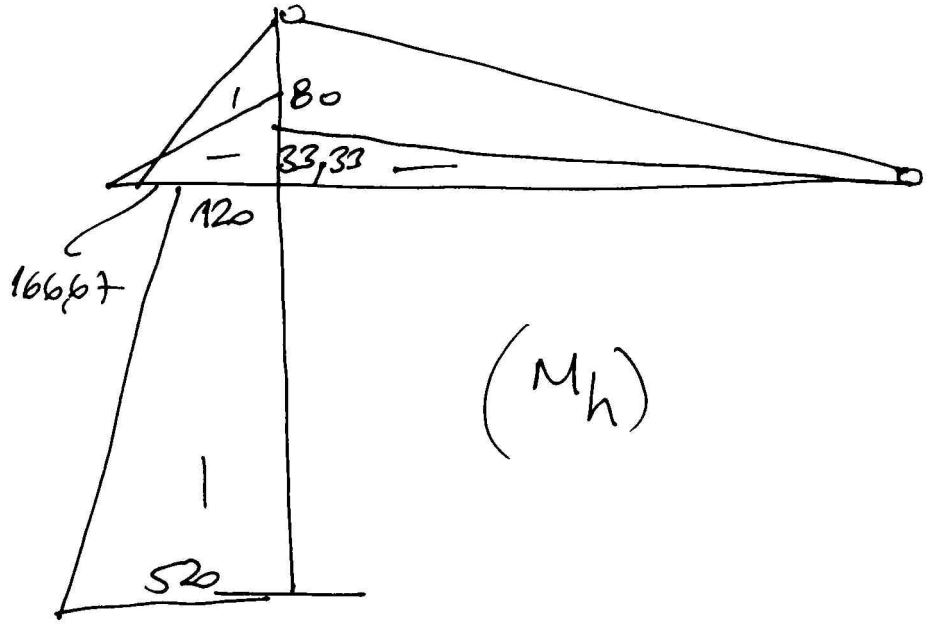
(M_1)

$x_1 = 1$ yüklemesi

$$\delta_{10} = \frac{1(-100+1{,}96)2}{3EI} + \frac{1}{3EI}(-100)(1{,}96)10 = -522{,}66/EI$$

$$\delta_{11} = \frac{1}{3}\cdot 2\cdot(-1{,}96)^2\cdot\frac{1}{EI} + \frac{1}{3}\cdot 10\cdot(1{,}96)^2\cdot\frac{1}{EI} = 15{,}37/EI$$

$$\delta_{10} + \delta_{11} \cdot x_1 = 0$$

$$-5226{,}66/EI + 15{,}77/EI \cdot x_1 = 0$$

$$x_1 = 34{,}01 \text{ kN}$$