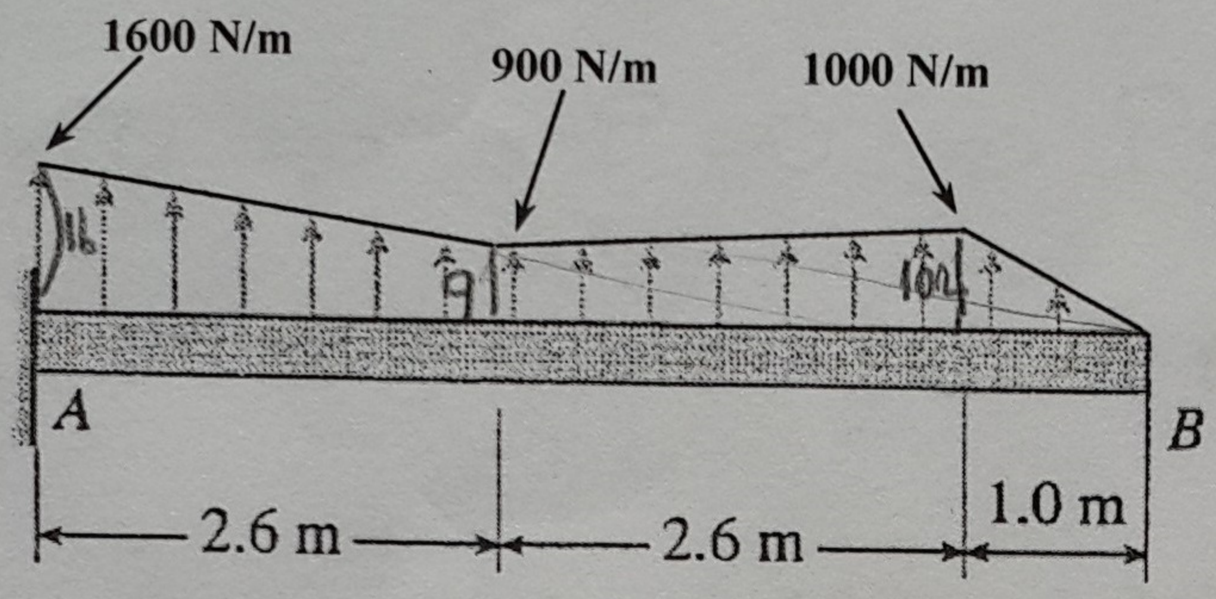
SU ÜRÜNLERİ FAKÜLTESİ <u>MUKAVEMET</u> MAZERET SINAV SORULARI 21.12.2011

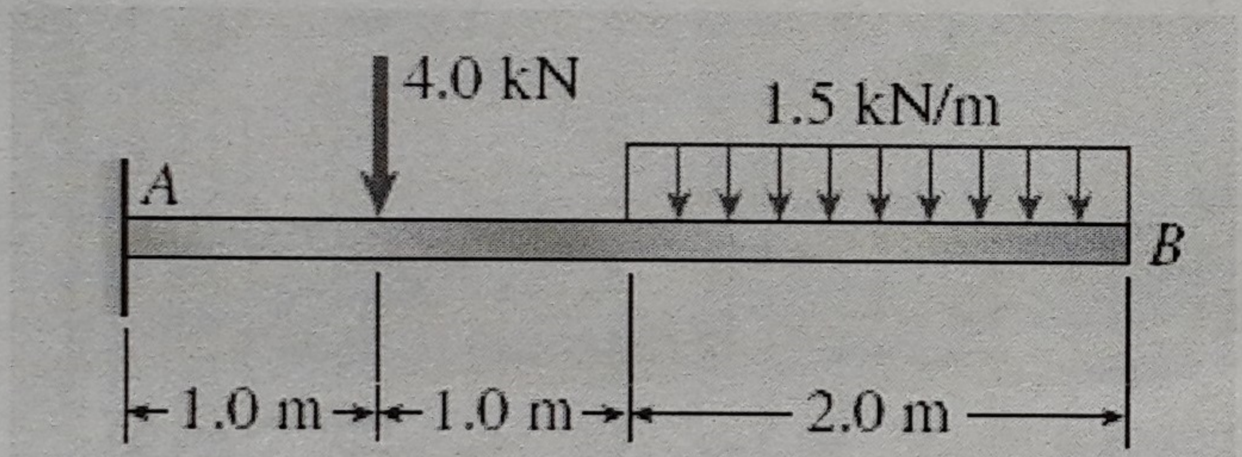
Sınav süresi **120** dakikadır. Notlar kapalıdır, hesap makinesi kullanılabilir. Cevaplar okunaklı ve anlaşılır olarak yazılmalı, tüm hesaplamalar cevap kağıdında gösterilmelidir. Aksi takdirde yapılanlar dikkate alınmayacaktır. Başarılar dilerim. Y.Doç.Dr. Yunus Ziya ARSLAN

Soru 1



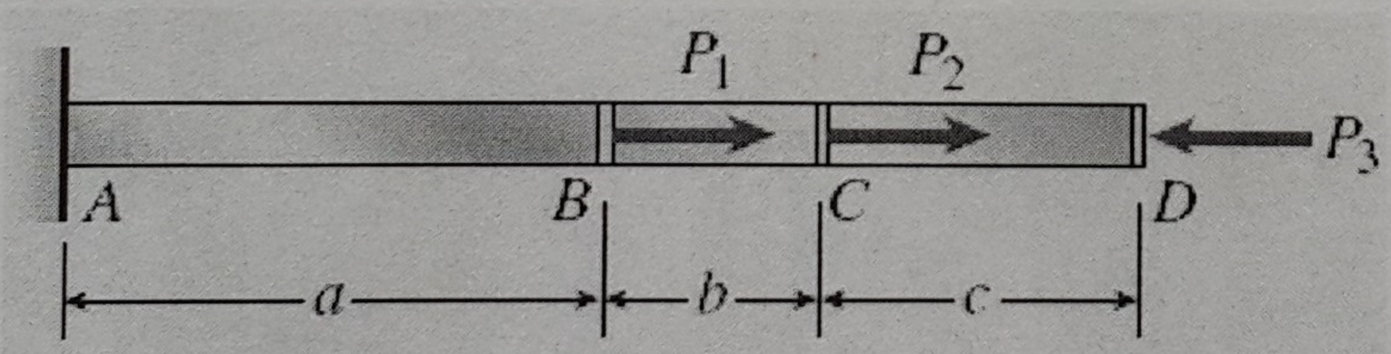
Şekildeki kirişin, ankastre mesnetle bağlanmış kısmında oluşan kesme kuvvetini ve eğilme momentini hesaplayınız.

Soru 2



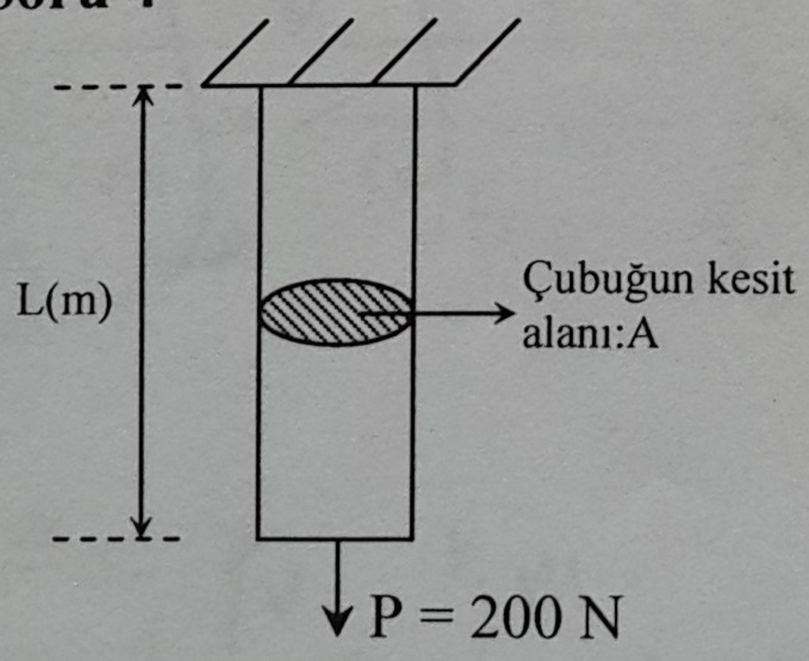
Şekildeki ankastre mesnetle bağlanmış kirişin normal kuvvet, kesme kuvveti ve eğilme momenti diyagramlarını kesit yöntemiyle, hepsi alt alta gelecek şekilde, çiziniz.

Soru 3



Şekildeki dairesel kirişin kesit alanı $10cm^2$ dir. $P_1 = 2700N$, $P_2 = 1800N$, $P_3 = 1300N$, a = 60cm, b = 24cm, c = 36cm olduğuna göre çubuktaki toplam eksenel uzama (ya da kısalma) miktarını hesaplayınız. Çubuğun elastik modülü E = 100 GN/m^2 dir.

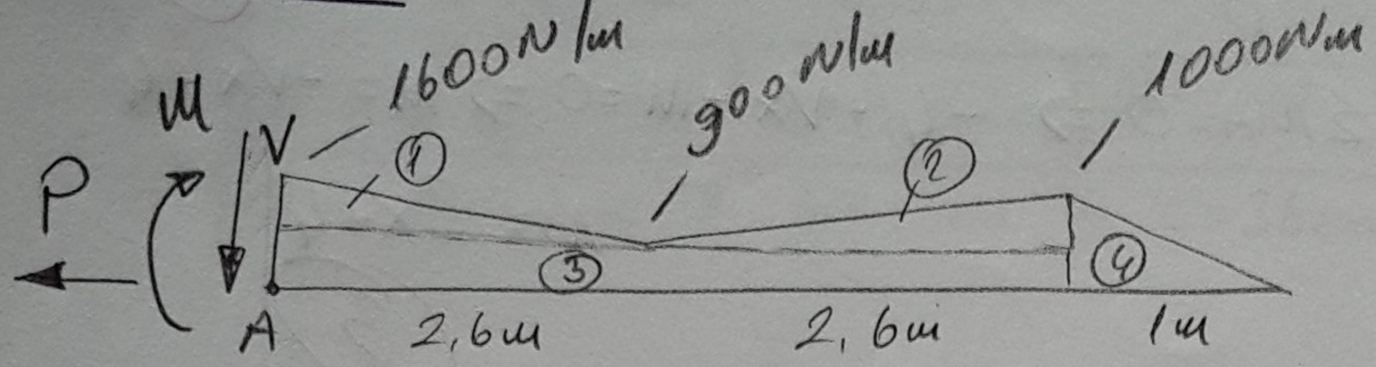
Soru 4



Şekildeki homojen çubuğun kütlesi m = 15kg, kesit alanı $A = 0.5m^2$, boyu L = 1.5m'dir. Çubuğun ağırlığından ve uygulanan P yükünden dolayı oluşan toplam uzamasını hesaplayınız. Çubuğun elastik modülü E = 100 GN/m^2 ve yerçekimi ivmesi $9.81m/s^2$dir.

- GÖZÜMLER -

Soru 1 !



$\Sigma F_x = 0 \Rightarrow -P = 0 \Rightarrow P = 0$ (5)

$\Sigma F_y = 0 \Rightarrow -V - 700 * \frac{1}{2} * 2,6 - 100 * \frac{1}{2} * 2,6 - 900 * 5,2 - 1000 * \frac{1}{2} \cdot 1 = 0$

$-V - 900 - 130 - 4680 - 500 = 0 \Rightarrow V = 6210N$ (10)

$\Sigma M_A = 0 \Rightarrow -M - 1600 * \frac{1}{2} * 2,6 * \frac{2,6}{3} - 100 * \frac{1}{2} * 2,6 * (2,6 + \frac{2}{3} \cdot 2,6)$

$- 1000 * \frac{1}{2} * 1 * (5,2 + \frac{1}{3}) - 900 * 5,2 * 2,6 = 0$

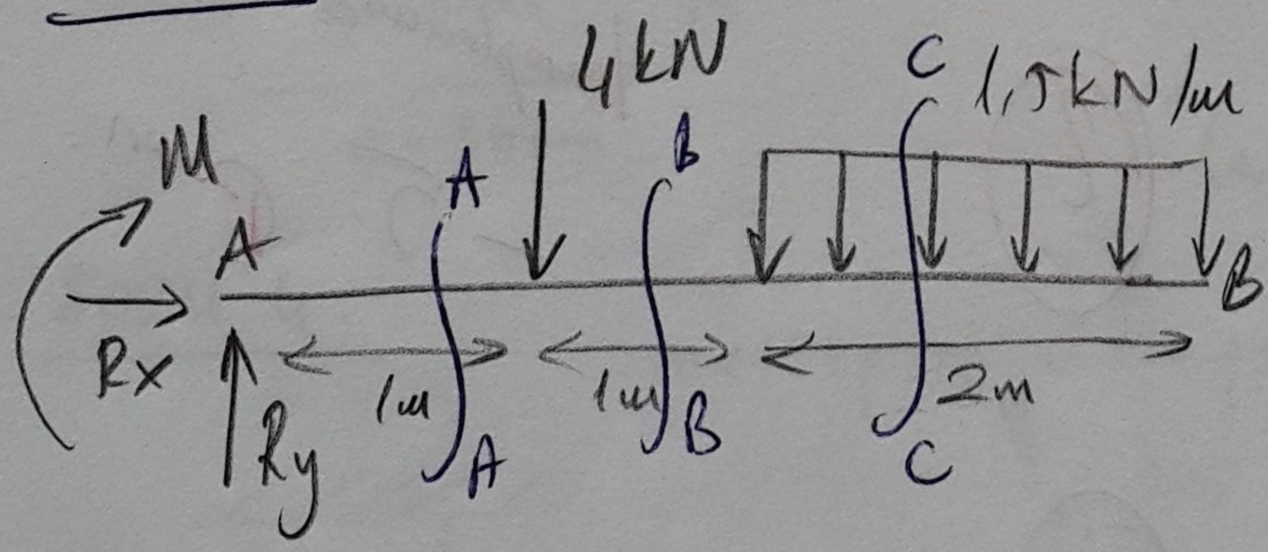
$-M - 1802,7 - 563,4 - 2766,7 - 5850 = 0$

$\Rightarrow M = -10982,8$ Nm. (10)

Sonuç yanlış hesaplanırsa

(— 5) puan

SORU 2 :



$\Sigma F_x = 0 \Rightarrow R_x = 0$ (1)

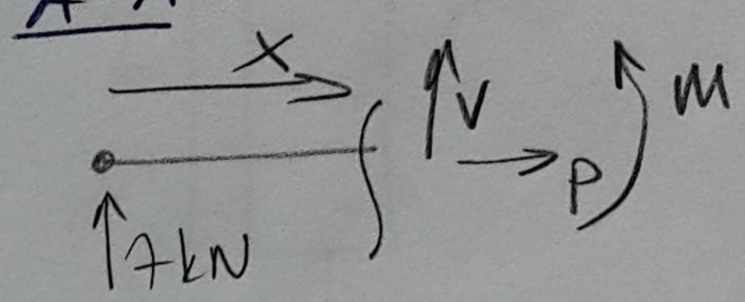
$\Sigma F_y = 0 \Rightarrow R_y - 4 - 1,5 * 2 = 0$

$R_y = 7kN$ (2)

$\Sigma M_A = 0 \Rightarrow -4 * 1 - 1,5 * 2 * 3 - M = 0$

$M = 4 + 9 = 13 kNm$ (3)

A-A



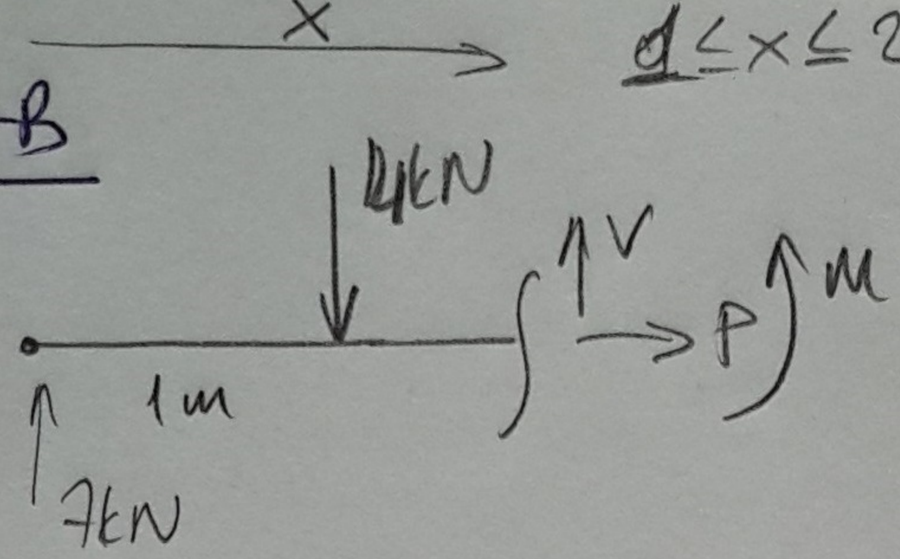
$0 \leq x \leq 1$

$P = 0$

$V = -7kN$ (2)

$M + Vx = 0 \Rightarrow M = 7x$ (3)

B-B



$0 \leq x \leq 2$

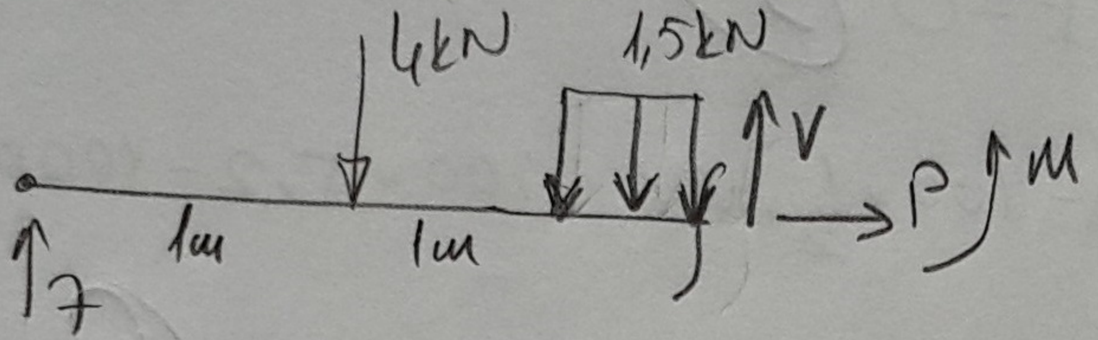
$\Sigma Fx=0 \Rightarrow P=0$

$\Sigma Fy=0 \Rightarrow 7-4+V=0 \Rightarrow V=-3kN$ (2)

$\Sigma MA=0 \Rightarrow -4+Vx+M=0 \Rightarrow M=-Vx+4$

$M=3x+4$ (3)

C-C



$2 \leq x \leq 4$

$\Sigma Fy=0 \Rightarrow 7-4-1,5(x-2)+V=0$

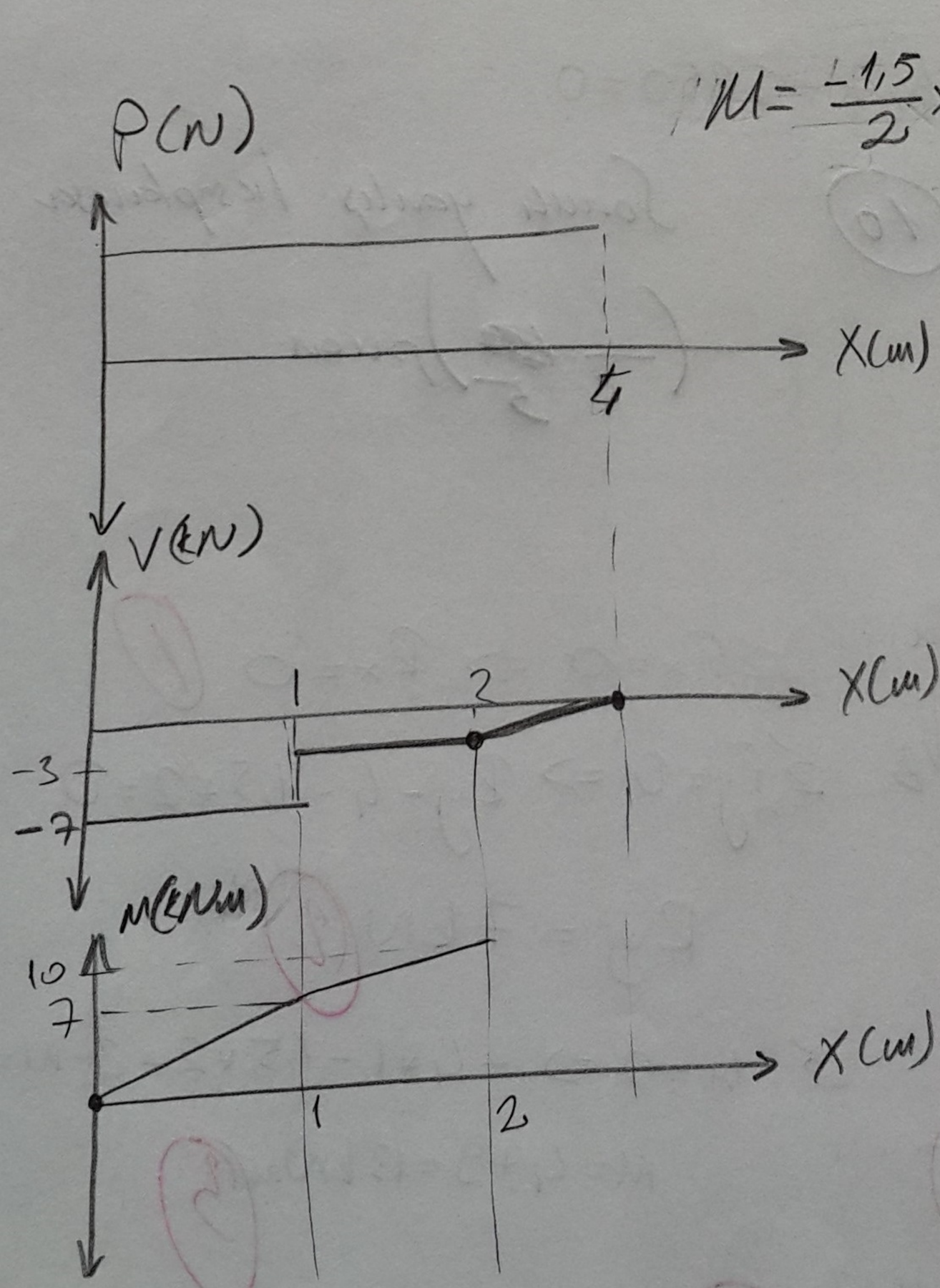
$3-1,5x+3+V=0 \Rightarrow V=1,5x-6$ (2)

$\Sigma M_A=0 \Rightarrow -4-1,5*(x-2)\left(2+\frac{x-2}{2}\right)+Vx+M=0$

$M=-Vx+4+1,5\left(2x+\frac{x^2-2x}{2}-4-\frac{2x-4}{2}\right)$

$M=-1,5x^2+6x+4+3x+\frac{1,5}{2}x^2-1,5x-6-1,5x+3$

$M=\frac{-1,5}{2}x^2+6x+1$ (3)

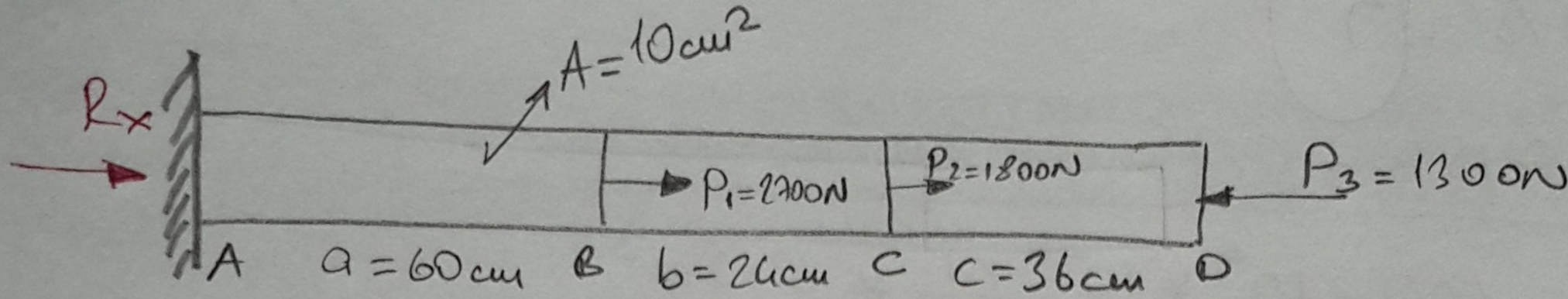


(1) (2) (2)

Sommaire graphique

- 5 pour.

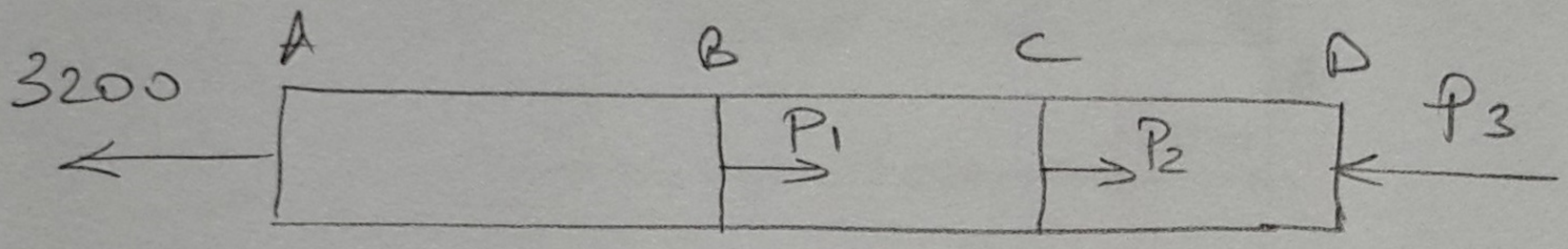
SORU 3

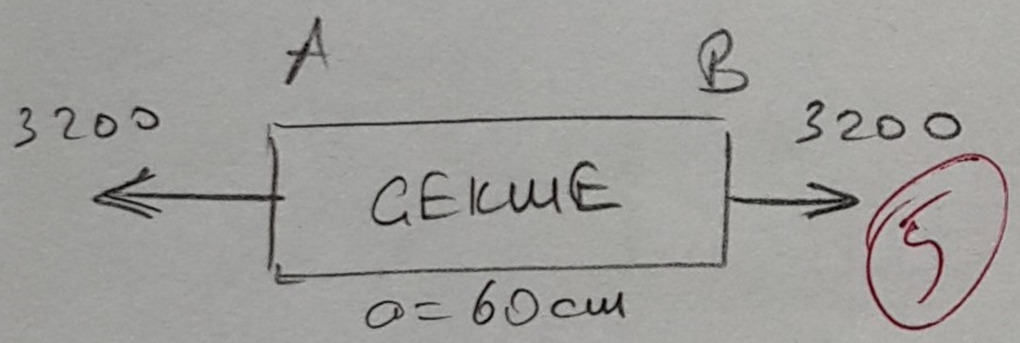


$\Sigma f_x = 0 \Rightarrow R_x + P_1 + P_2 - P_3 = 0$

$R_x + 2700 + 1800 - 1300 = 0 \Rightarrow R_x = -3200N.$

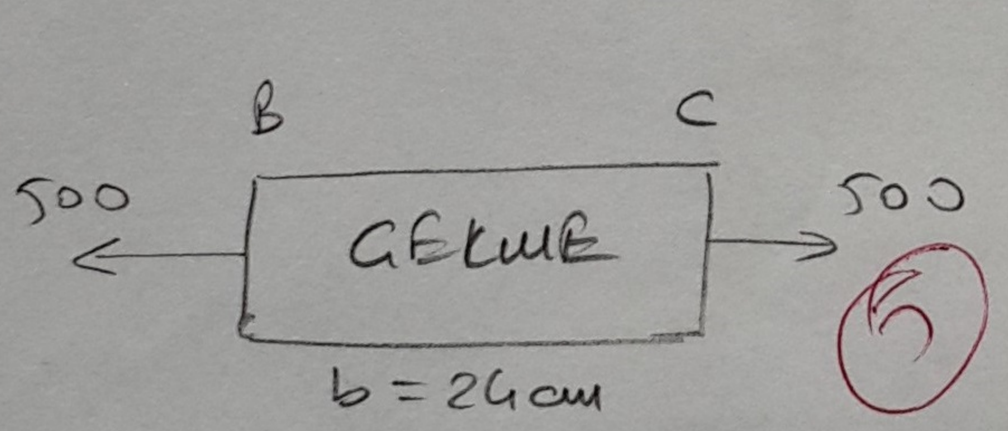
(5)



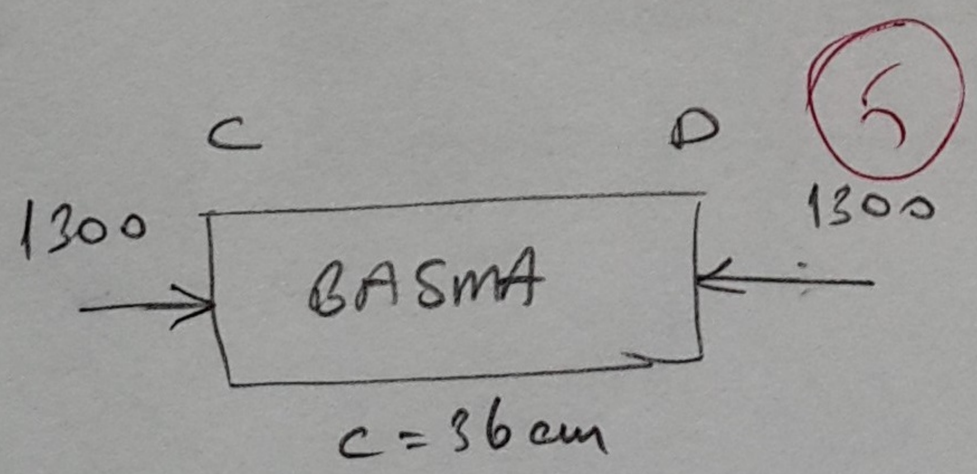


(5)

$\Delta l_T = \Delta l_1 + \Delta l_2 - \Delta l_3$



(5)



(5)

$$\Delta l_T = \frac{(3200.60 + 500.24 - 1300.36)N.cm}{100 * 10^9 N * 10^{-4} * 10cm^2} * cm^2$$

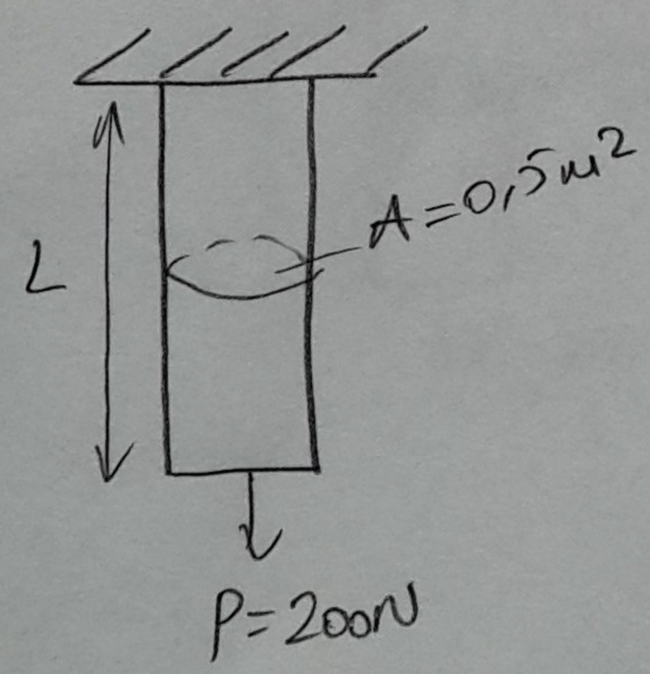
$$\Delta l_T = \frac{(192000 + 12000 - 46800)cm}{10^8}$$

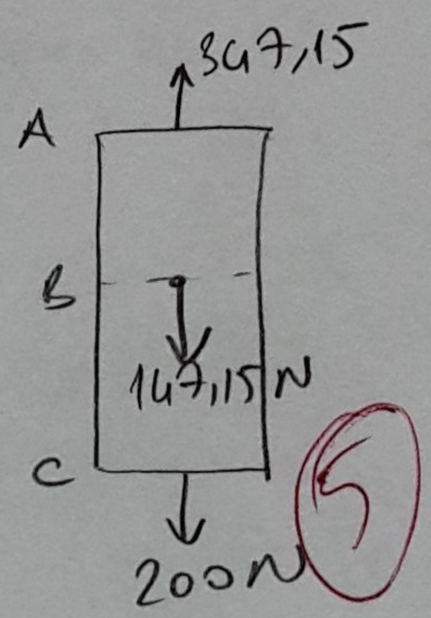
$\Delta l_T = 157,2 * 10^{-5}$ cm bulunur.

(5)

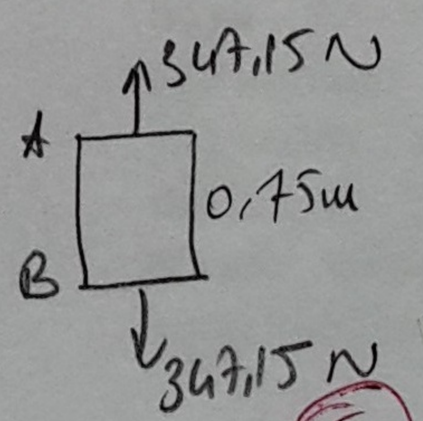
SORU 4:

$m = 15kg \Rightarrow G = m.g = 15 * 9,81 = 147,15\ N$

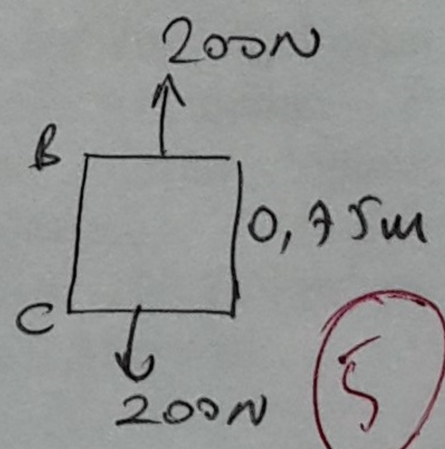




(5)



(5)



(5)

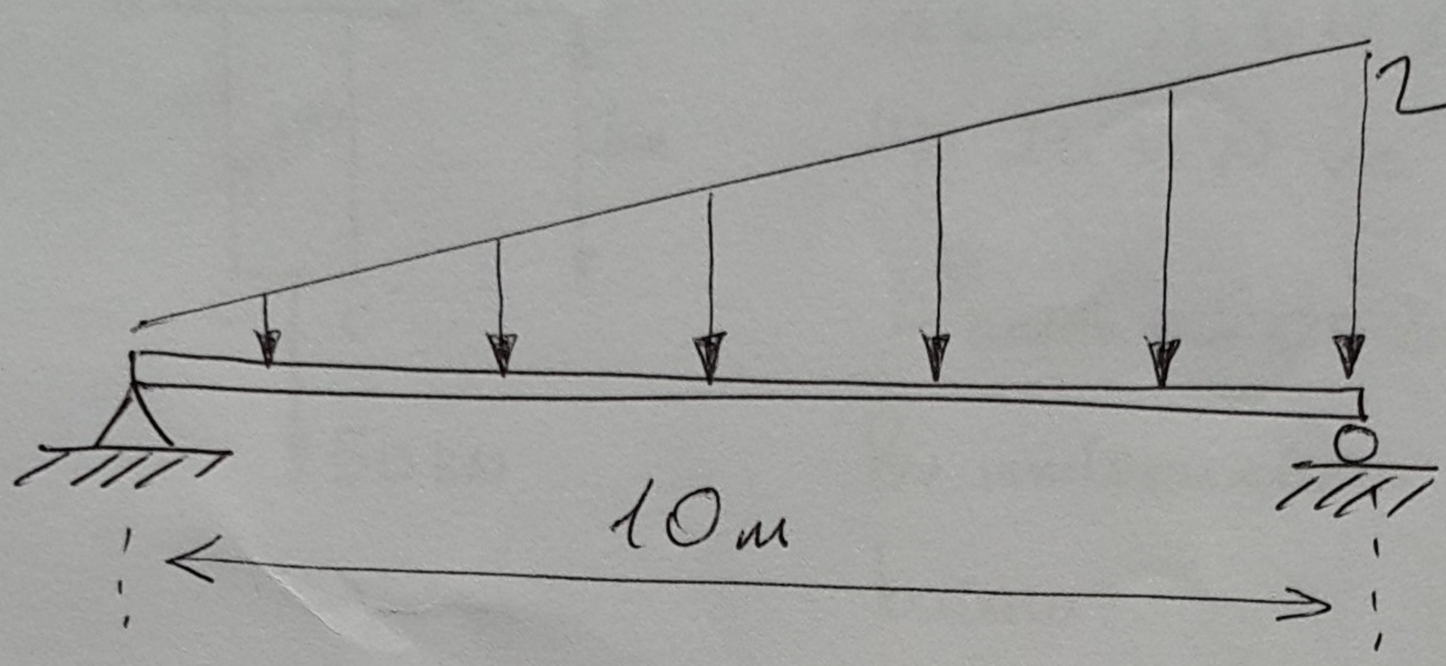
$$\Delta L_T = \Delta L_1 + \Delta L_2 \quad (5)$$

$$\Delta L_T = \frac{347{,}15\,N * 0{,}75m + 200N * 0{,}75m}{100 * 10^9 * 10^{-6}\,\frac{N}{m^2} * 0{,}5m^2} =$$

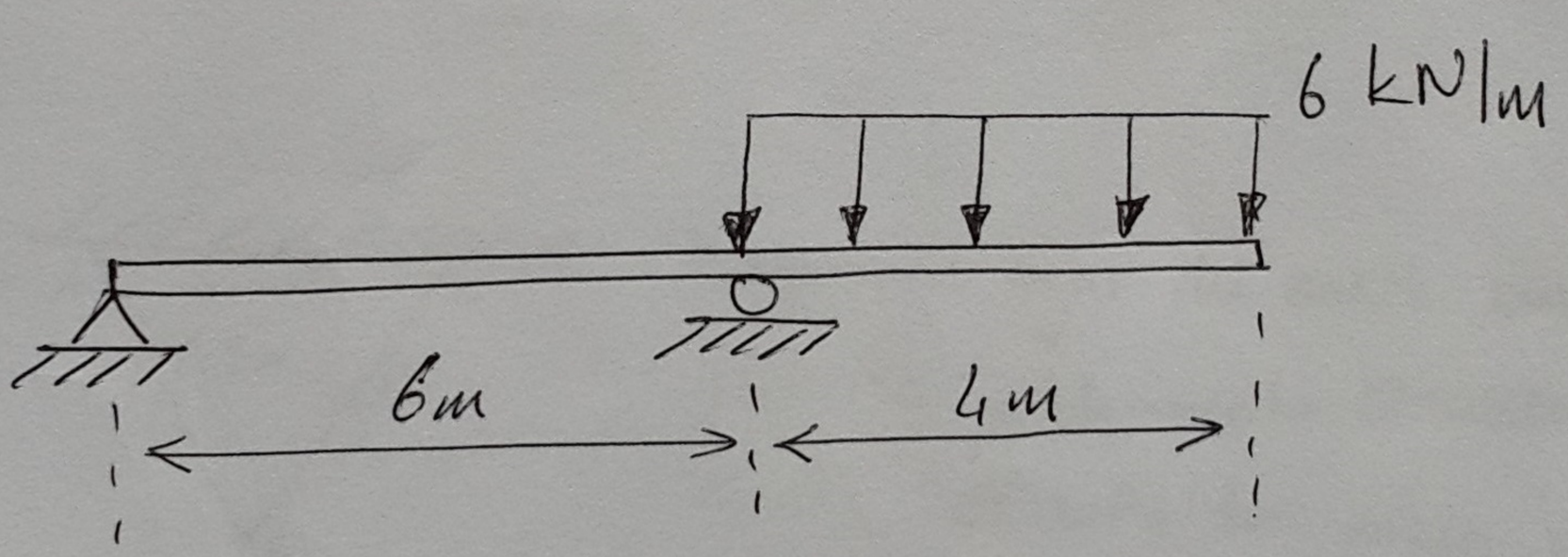
$$\Delta R_T = \frac{260{,}4 + 150}{5 * 10^4} = 82{,}08 * 10^{-4}\,m \quad (5)$$

Aşağıdaki kirişlerin kesit tesir (normal kuvvet, kesme kuvveti, eğilme momenti) diyagramlarını çiziniz.

1-)



2-)



3-