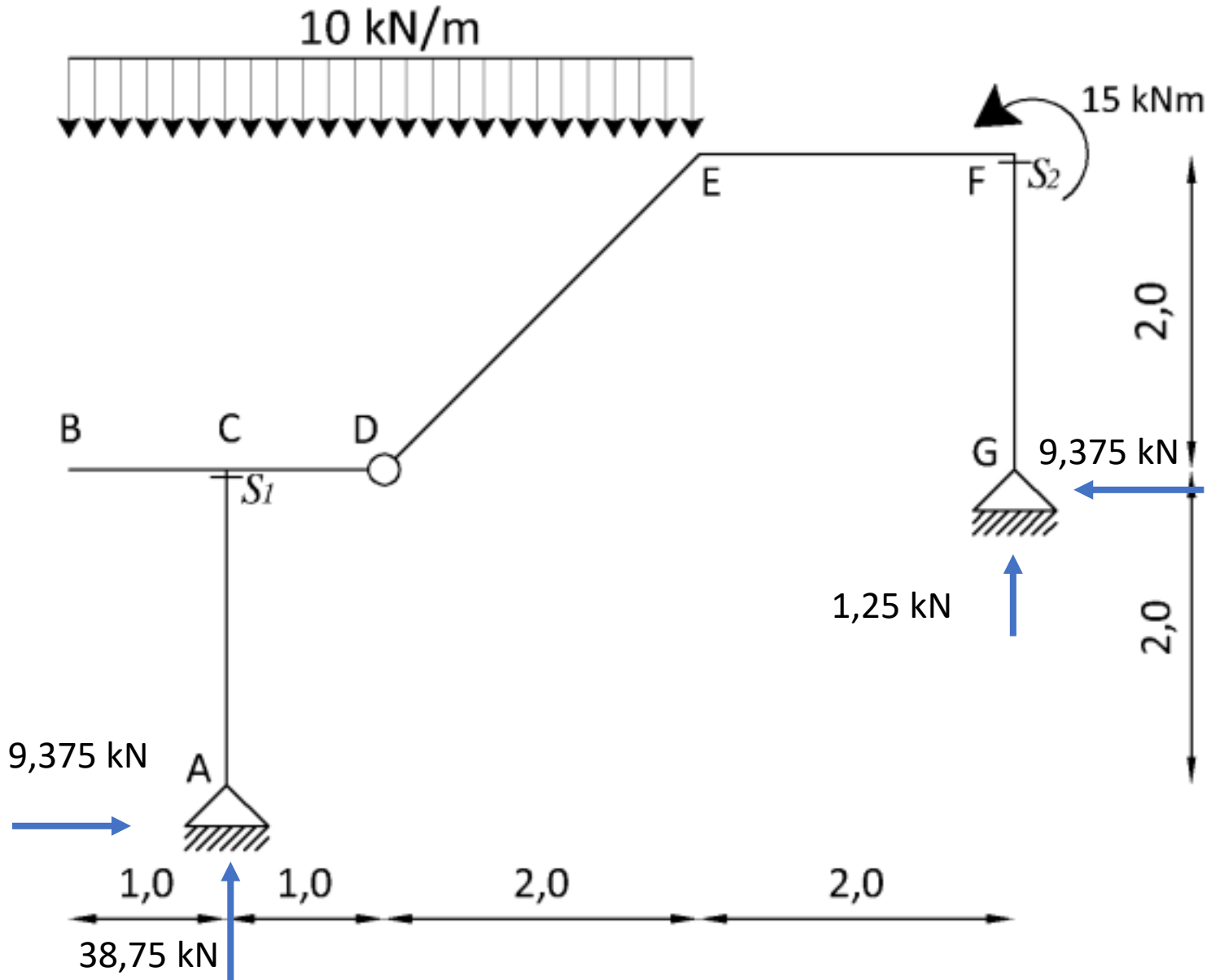
Dimensionado de Pórticos

Dimensionado de pórticos

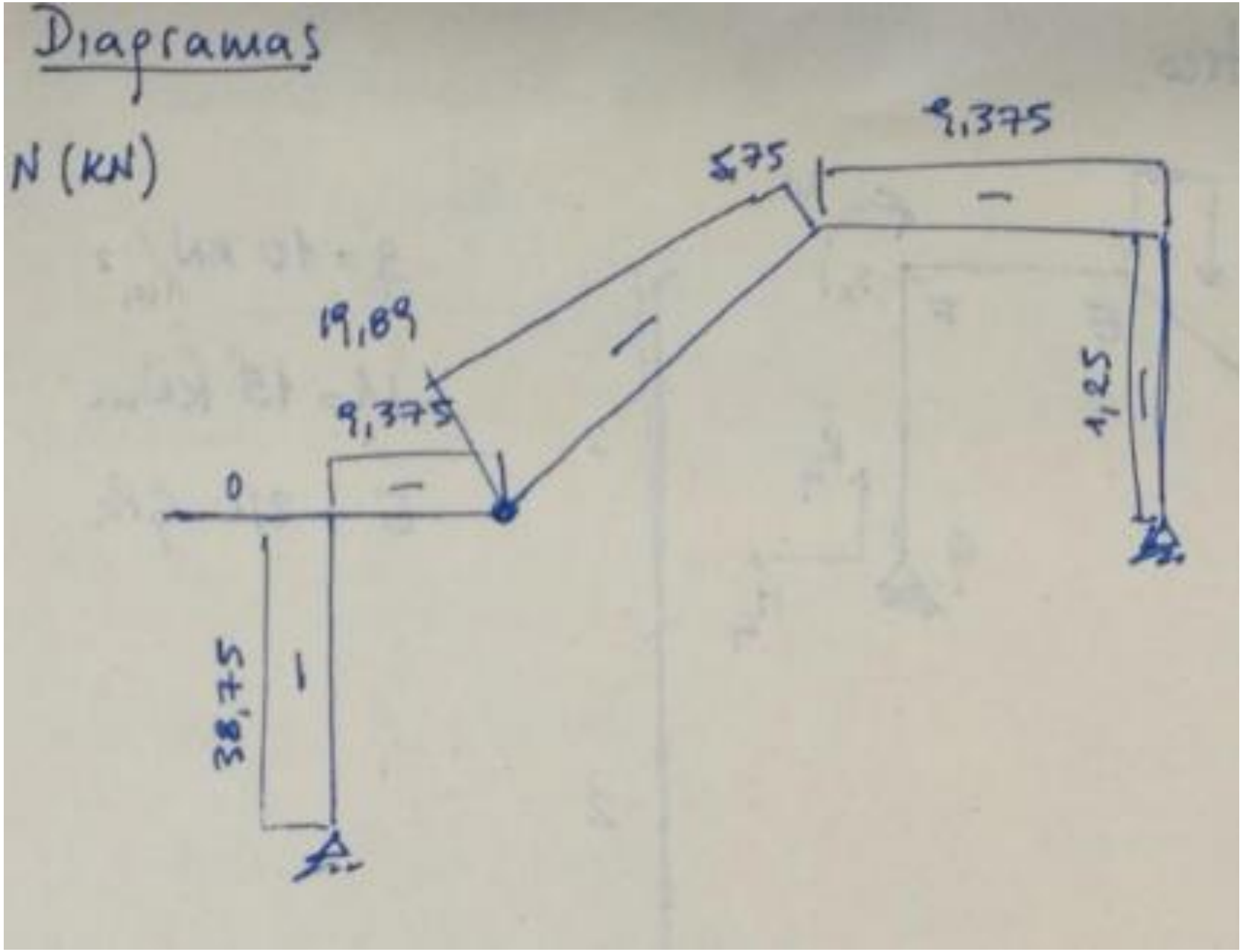
Flexión compuesta:	$\sigma = \frac{N}{A} + \frac{M}{I} y$
Cortante:	$\tau = \frac{V \mu}{I b}$

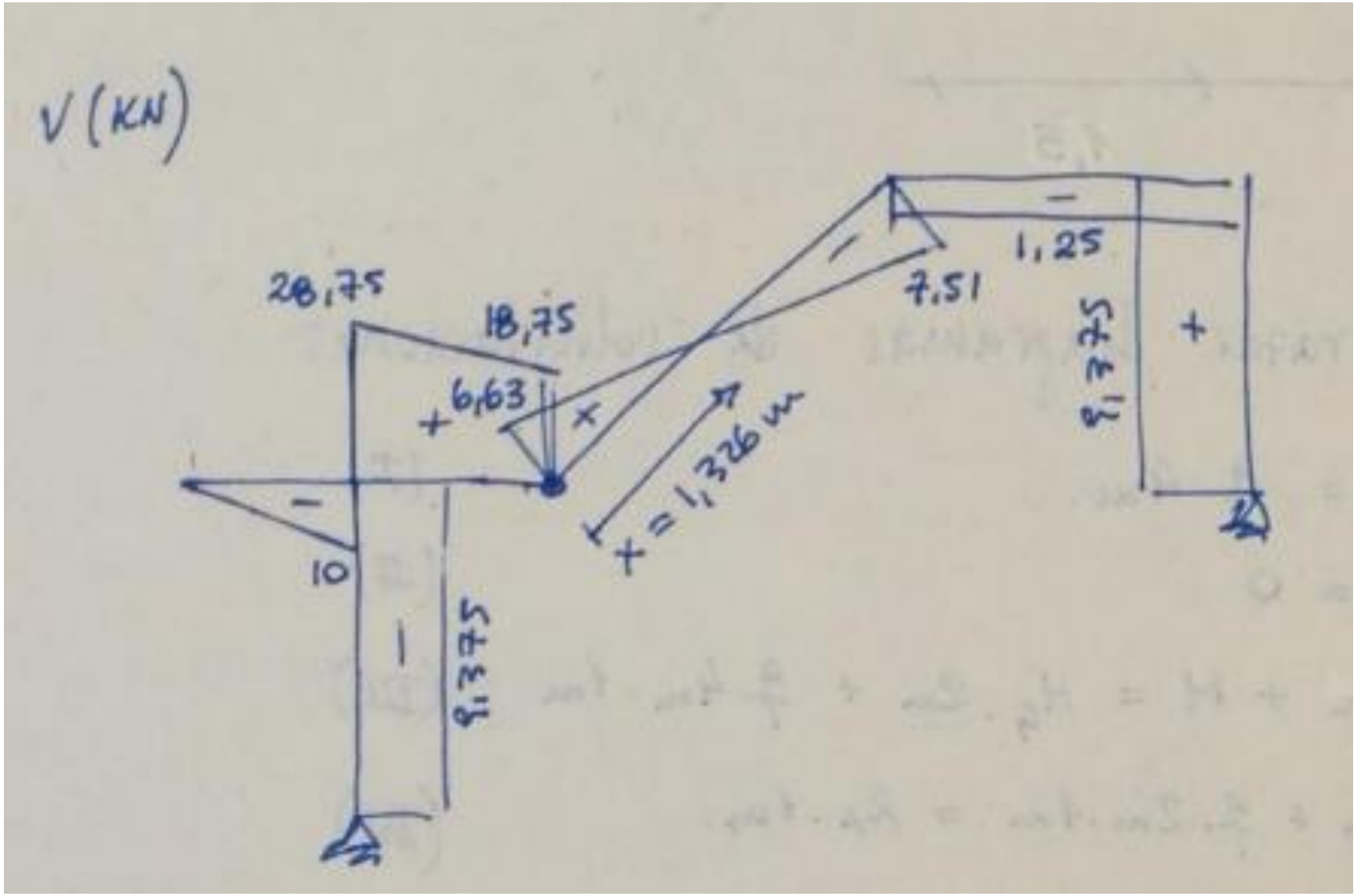
Resistencia de Materiales 1 – 30 de noviembre del 2019

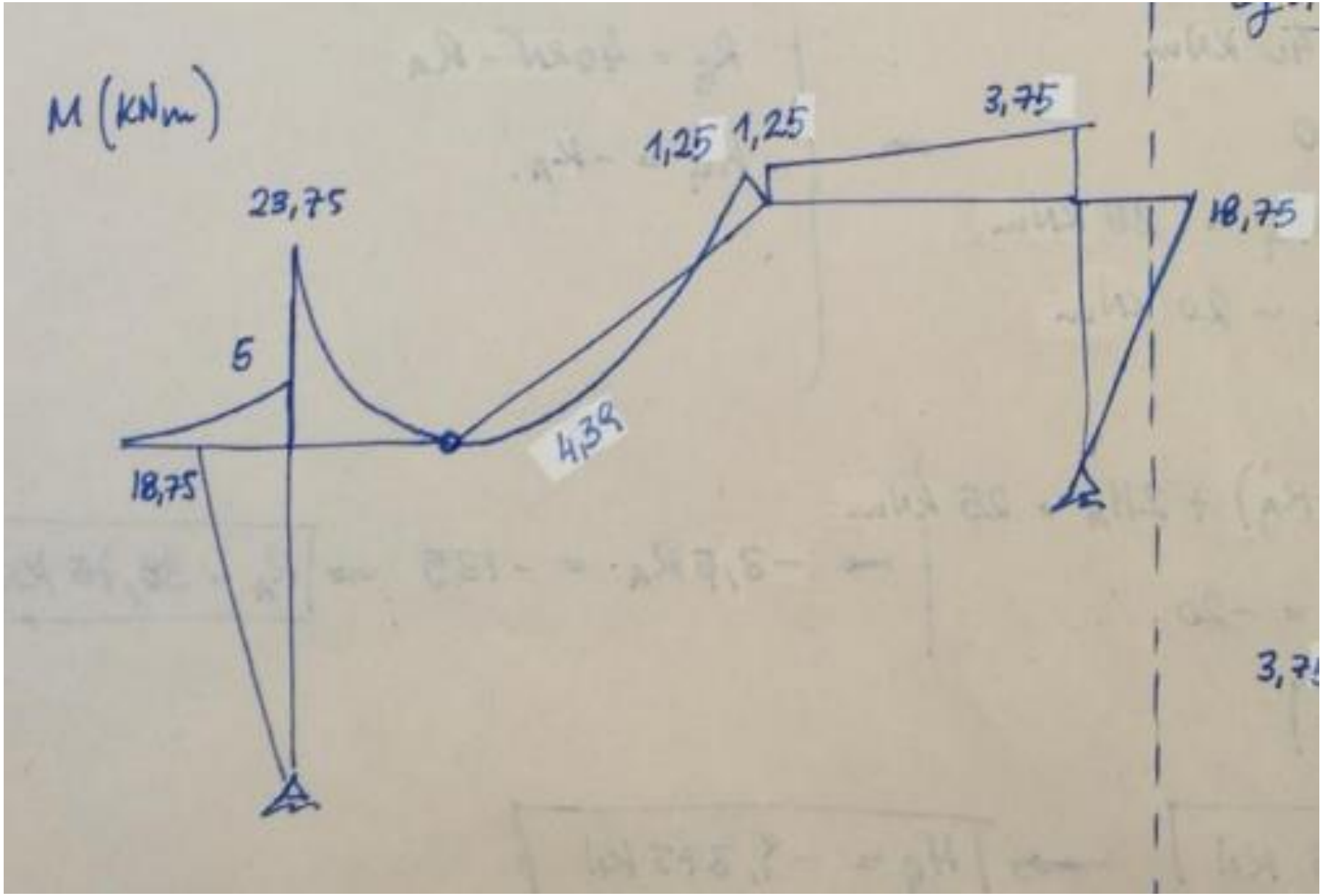


Diagramas

N (kN)




V (KN)
20,75
18,75
6,63
x
x = 1,326 m
10
8,375
7,51
1,25
8,375
+
−
−
−
+


M (kNm)
23,75
1,25
1,25
3,75
18,75
5
4,39
18,75

Dimensionado

Flexión compuesta:	$\sigma = \frac{N}{A} + \frac{M}{I} y$
Cortante:	$\tau = \frac{V\mu}{Ib}$

σ_{adm} = 140 MPa

τ_{adm} = 70 MPa

Predimensionado con M/W

- Mmax=23,75 kN.m

W= 169,6 cm3

IPN 200 (W=214 cm3 y A= 33,4 cm2)

Verifico con Mmax y con Nmax

$$N_{max} = 38{,}75\ kN$$

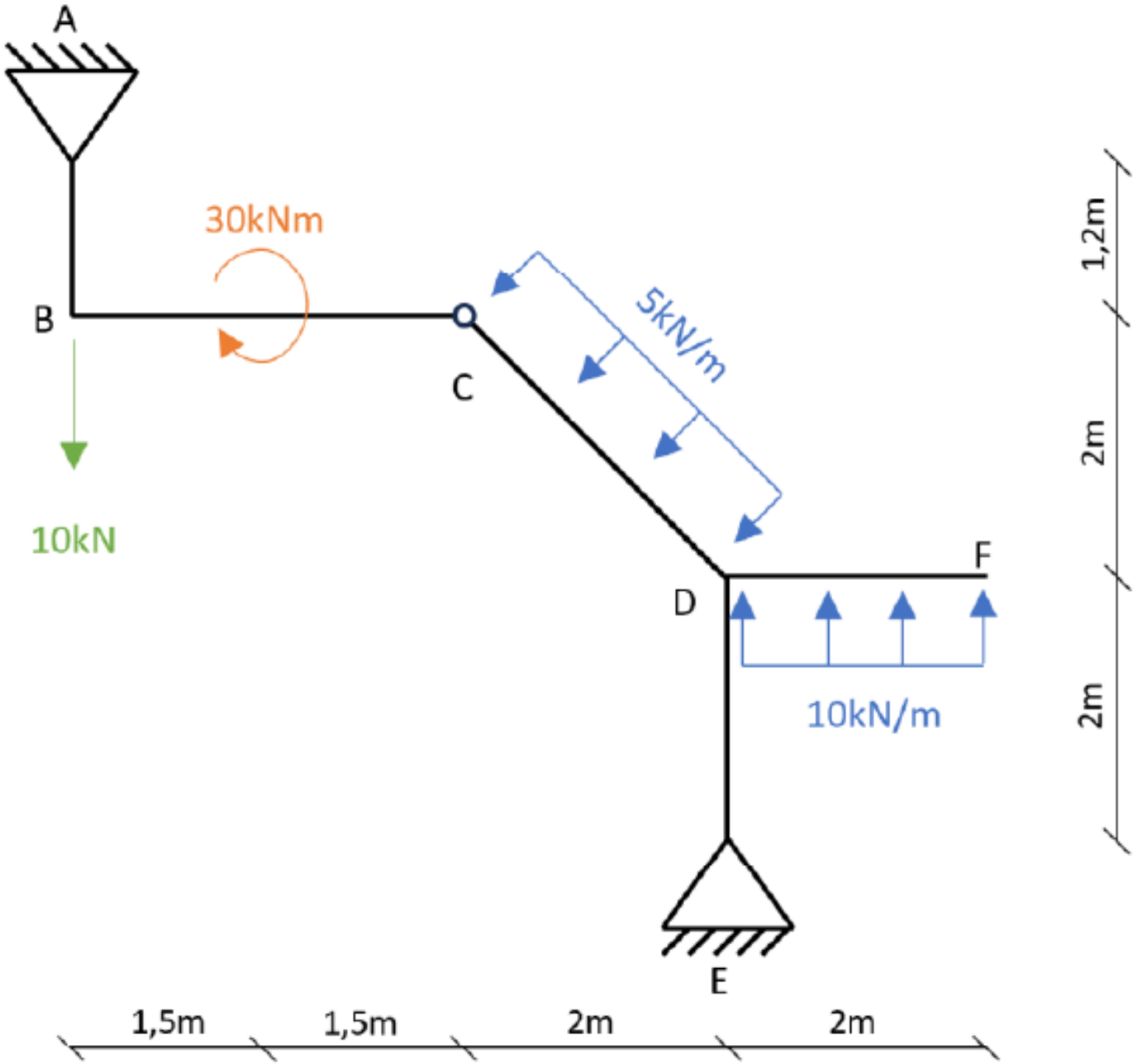
$$\sigma = M_{max}/W + N_{max}/A = 122{,}6\ MPa < 140\ MPa$$

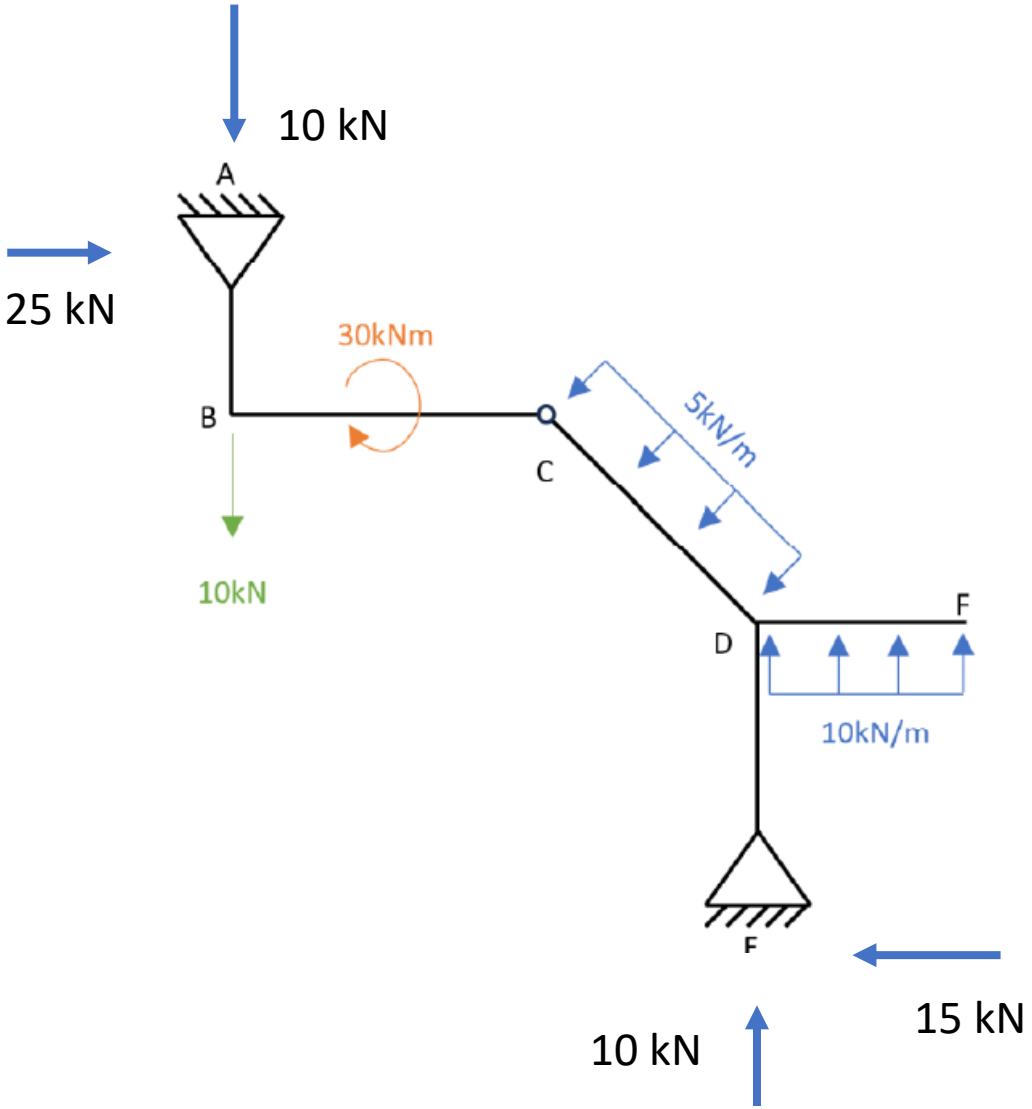
Tensiones rasantes

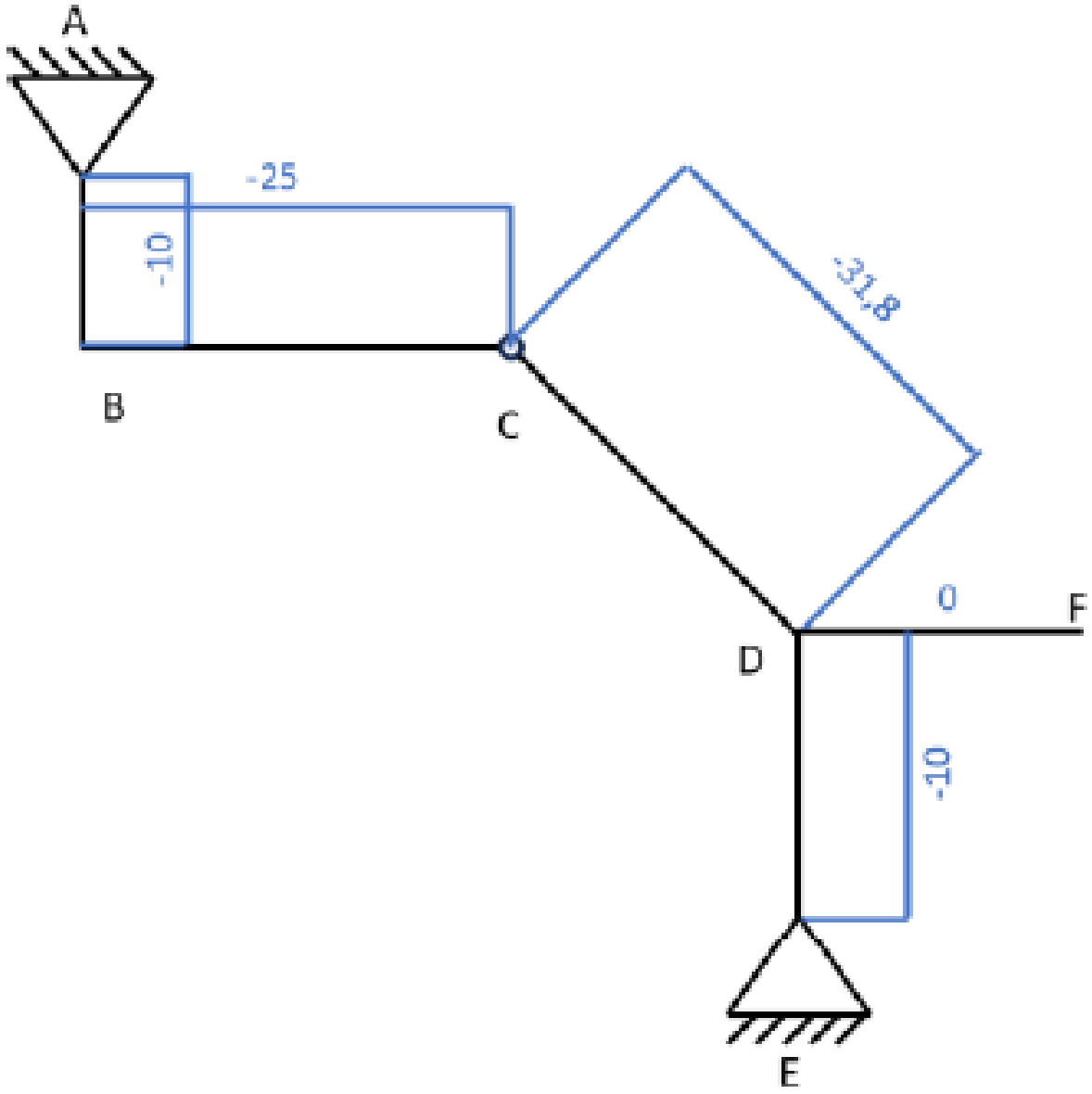
- IPN 200 μ_G= 125 cm3
- b=7,5 mm
- I=2140 cm4
- V_{max}= 28,75 k

- τ_{max} =22,4 MPa< 70 MPa

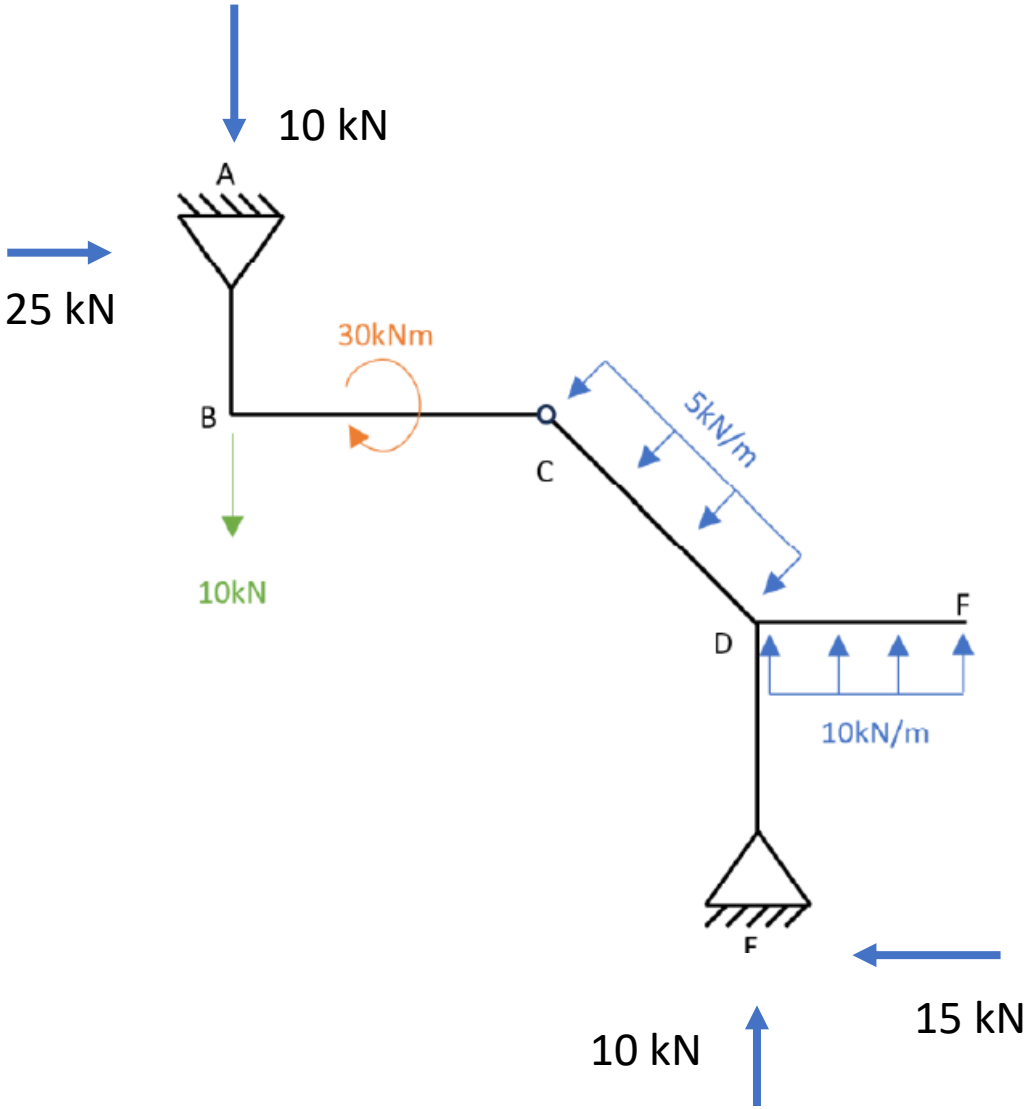
Examen

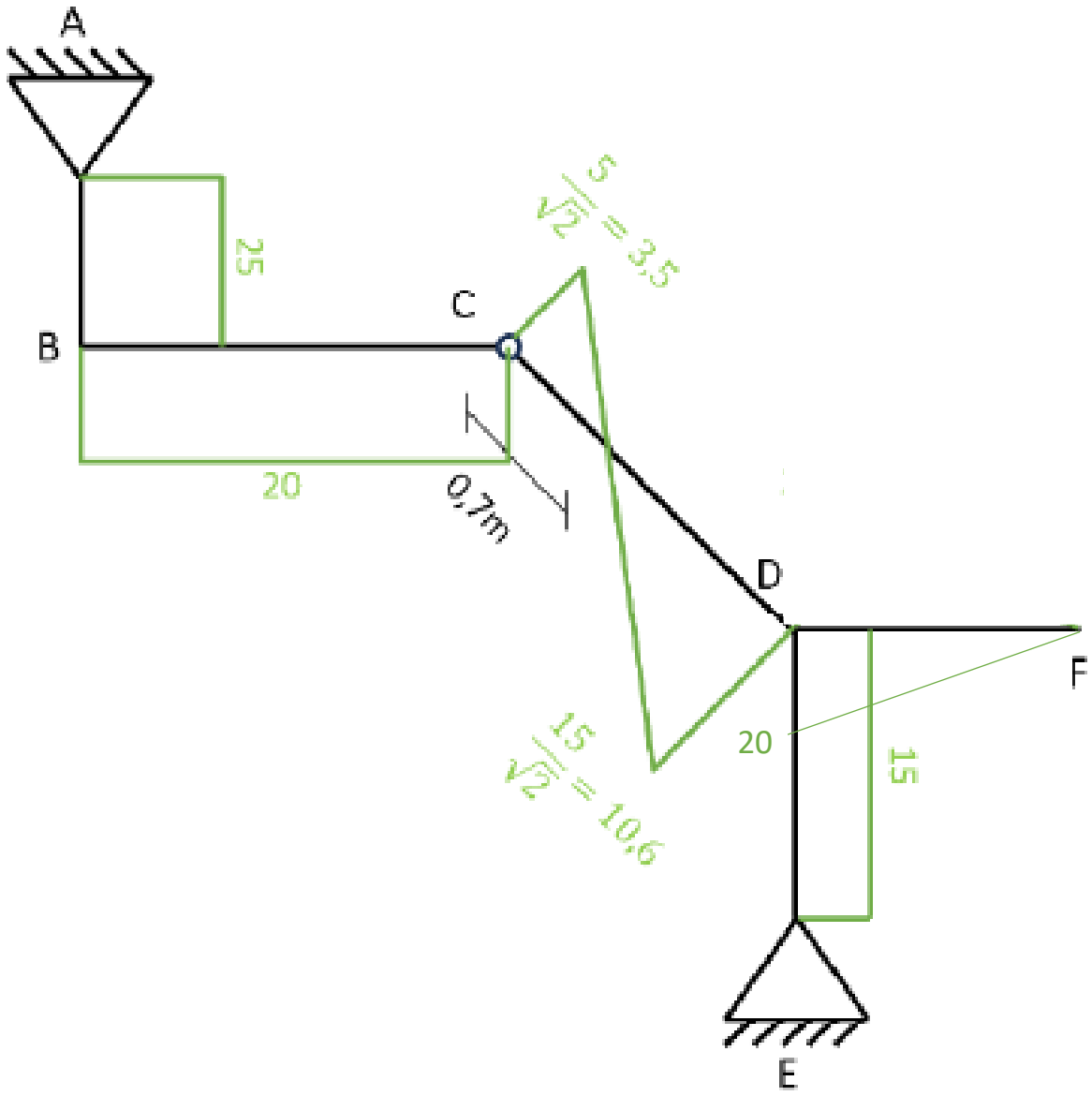



10 kN
A
25 kN
30kNm
B
C
5kN/m
10kN
F
D
10kN/m
E
10 kN
15 kN

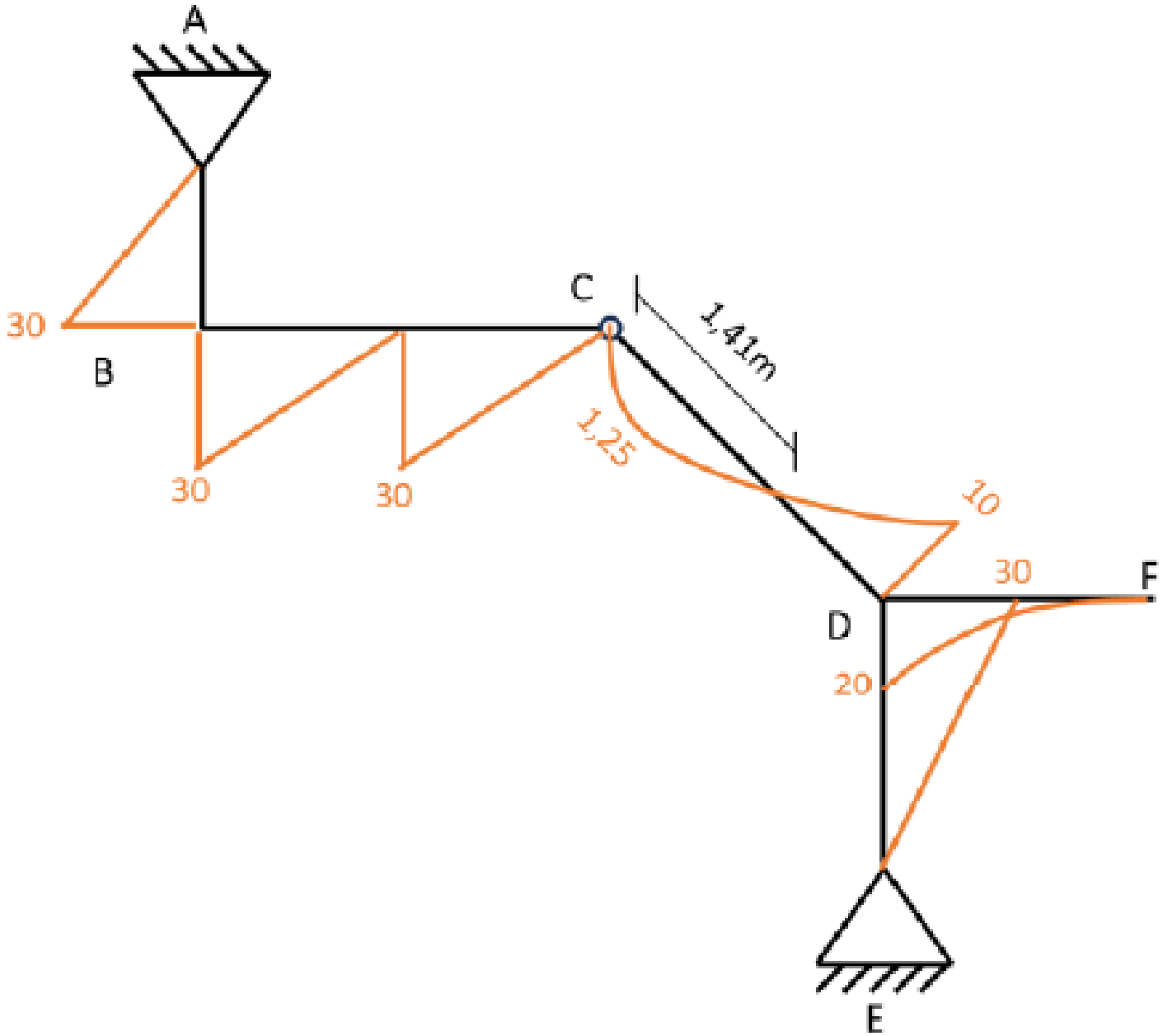

A
-25
-10
-31,8
B
C
0
F
D
-10
E

Cortante (*kN*):


10 kN
A
25 kN
30kNm
B
C
5kN/m
10kN
F
D
10kN/m
E
15 kN
10 kN


A
25
B
C
5/√2 = 3,5
20
0,7m
D
F
20
15
15/√2 = 10,6
E

Momento (*kNm*):



Predimensionado

Parte C

La directa y momento máximo se dan en el tramo *CD* con los valores:

$$M_{max} = 30kNm \text{ y } N_{max} = 31{,}8kN$$

Pre dimensiono con $M_{max} = 30kNm$: $W > \frac{M_{max}}{\sigma_{adm}} = 214cm^3$

Inercia de un círculo hueco: $I = \frac{\pi}{4}(R^4 - (R-e)^4)$

Módulo resistente de un círculo hueco: $W = \frac{I}{R} = \frac{\pi}{4R}(R^4 - (R-e)^4)$

$$A = \pi(R^2 - (R-e)^2)$$

Verificación del dimensionado

Si $R = 9 \Rightarrow A = 53{,}4cm^2; I = 1936cm^4; \ W = 215cm^3$

$\sigma_{max} = \frac{M_{max}}{W} + \frac{N_{max}}{A} = 145MPa > \ \sigma_{adm}$, entonces lo rechazo.

Si $R = 10 \Rightarrow A = 59{,}7cm^2; I = 2701cm^4; \ W = 270cm^3$

$\sigma_{max} = \frac{M_{max}}{W} + \frac{N_{max}}{A} = 115MPa < \ \sigma_{adm}$, entonces lo tomo.

Dimensiono con R=10 cm