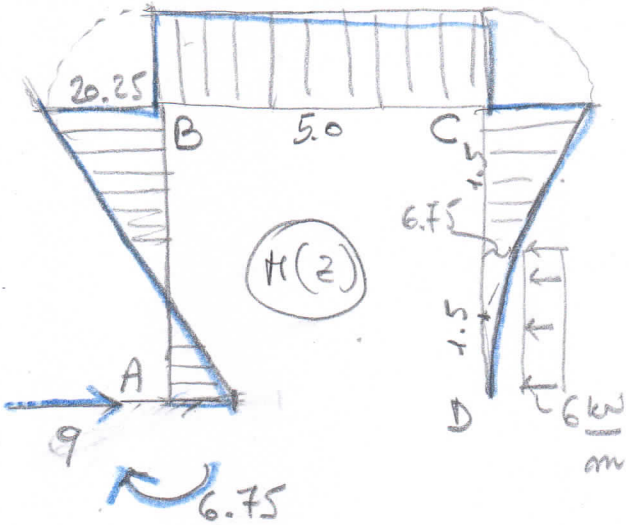
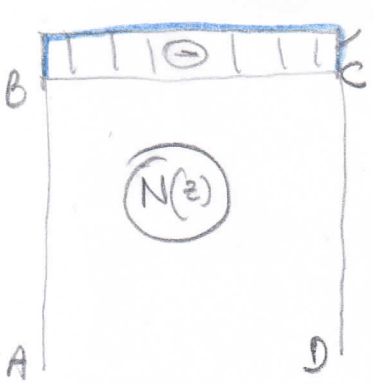
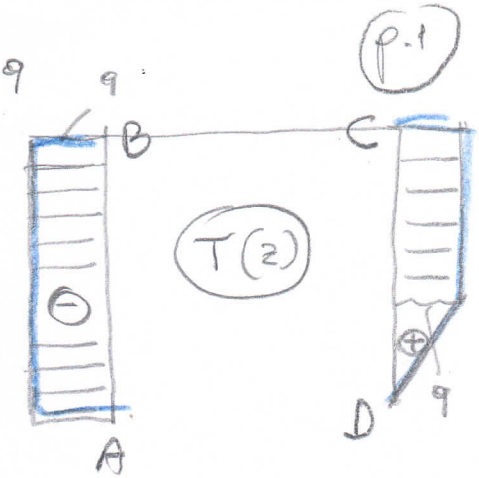
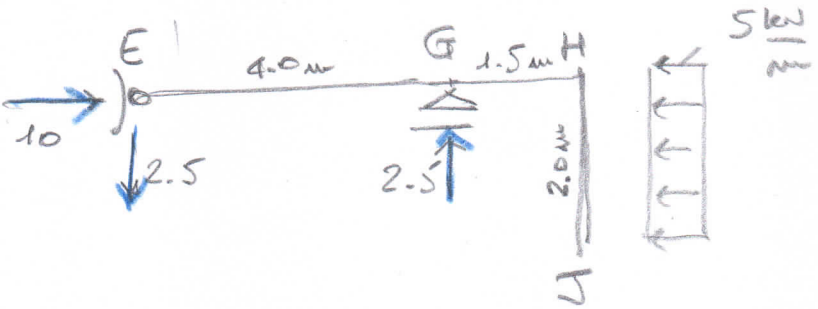
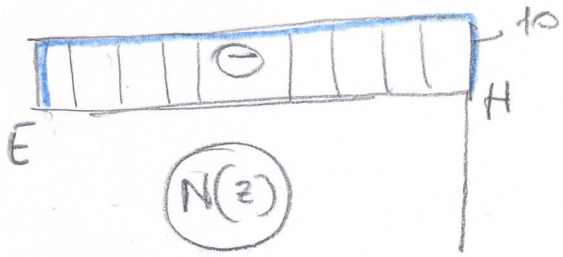

20.25
B
5.0
C
6.75
M(z)
A
D
q
6.75
6 kN/m

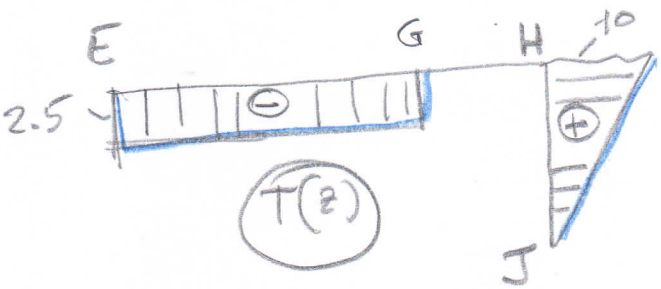

q
B
C
N(z)
A
D

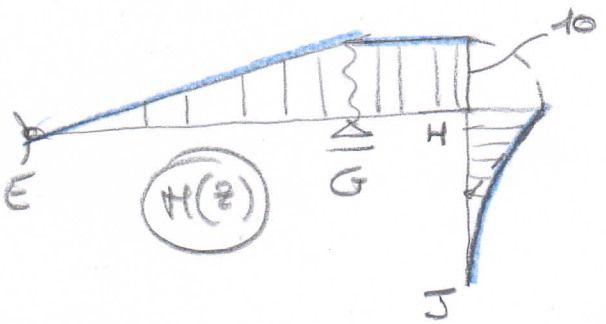

q
q
B
C
T(z)
A
D
q

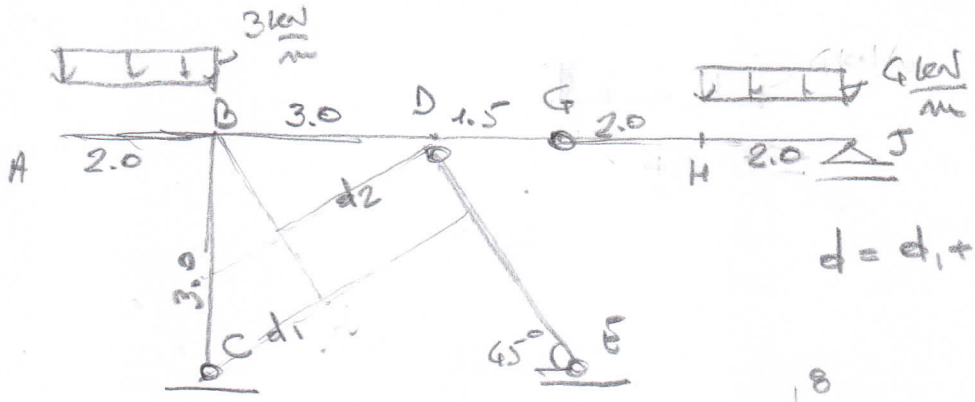
ES. 1


E
4.0 m
G
1.5 m
H
10
2.5
2.5
2.0 m
5 kN/m
J

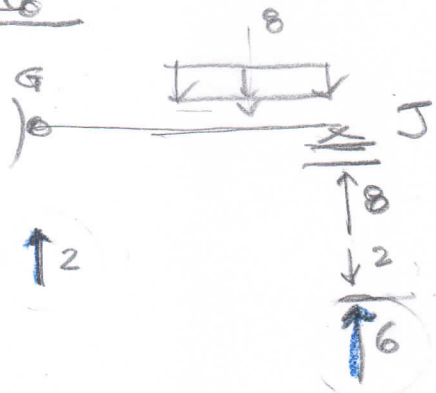

10
H
E
N(z)

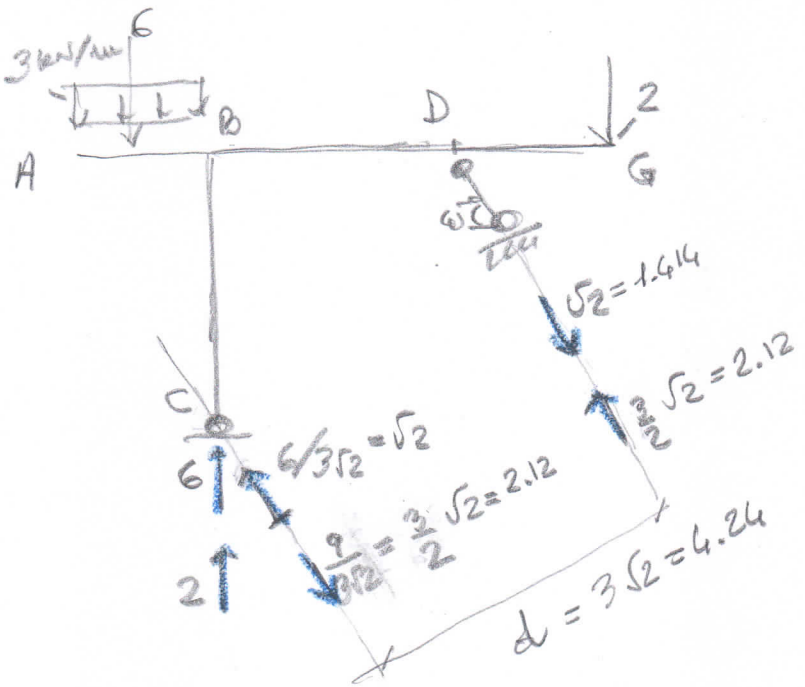

E
G
H
10
2.5
T(z)
J


10
H
E
G
H(z)
J



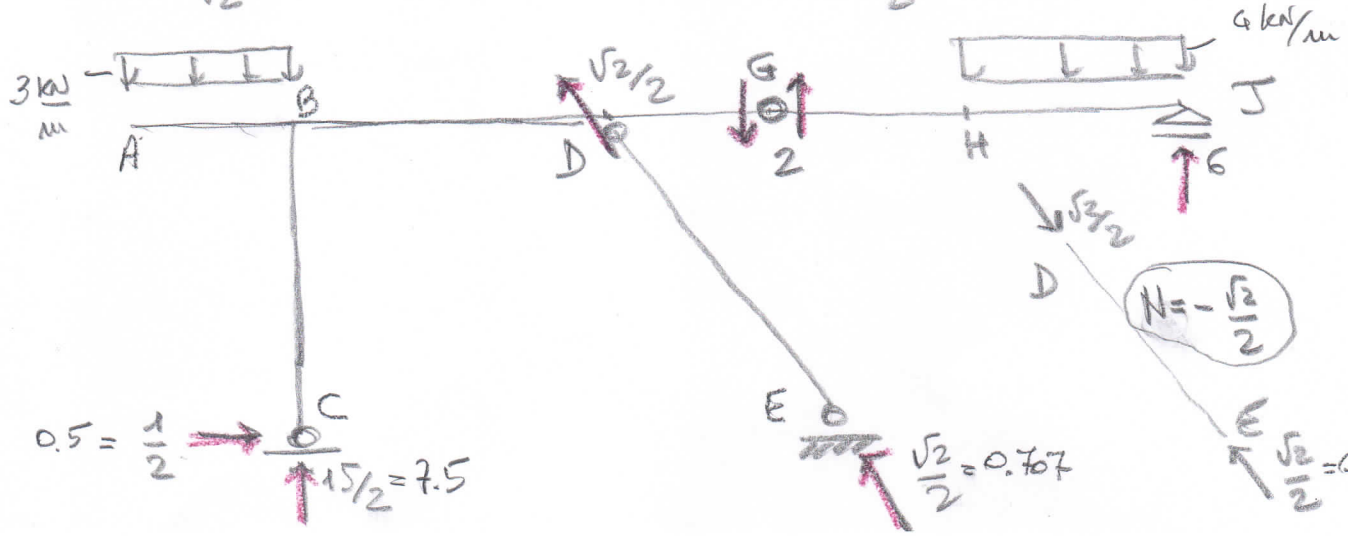

$$d = d_1 + d_2 = 3\frac{\sqrt{2}}{2} + 3\frac{\sqrt{2}}{2} = 3\sqrt{2} = 4.24$$

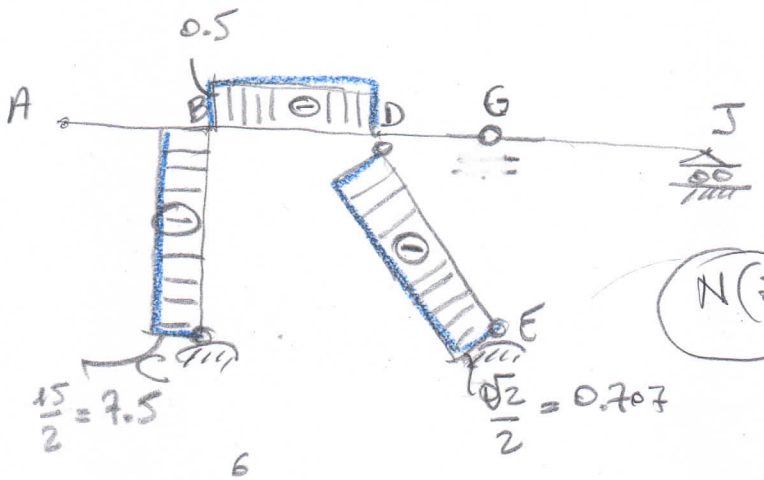


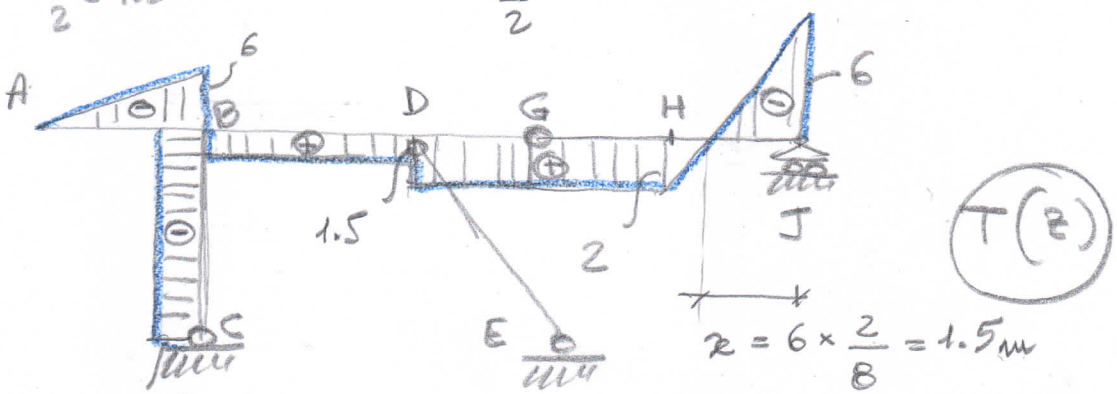



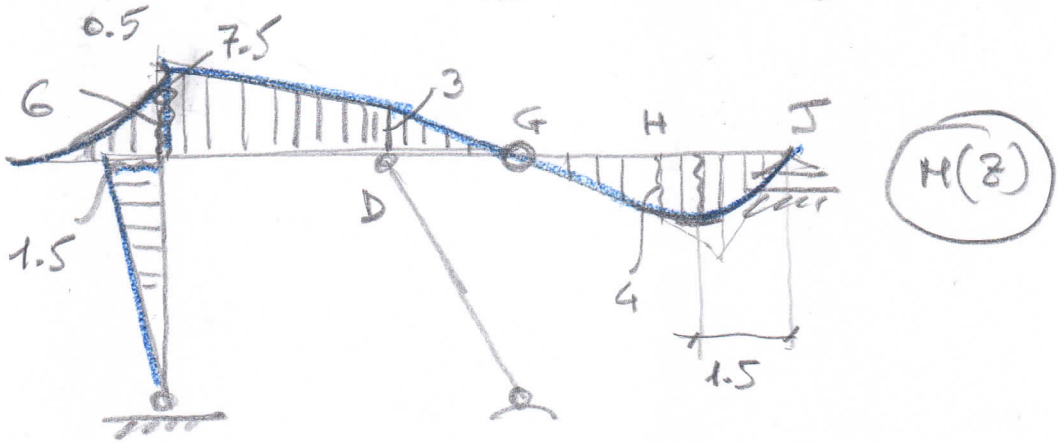

$$R_C = 8\uparrow + \uparrow 1 + \underset{1}{\leftarrow} + \downarrow \frac{3}{2} + \underset{\frac{3}{2}}{\rightarrow} = \underset{\frac{1}{2}}{\rightarrow} + \uparrow \frac{15}{2}$$

$$R_D = \underset{\sqrt{2}}{\downarrow} + \uparrow \frac{3}{2}\sqrt{2} = \uparrow \frac{\sqrt{2}}{2} = \underset{\frac{1}{2}}{\leftarrow} + \uparrow \frac{1}{2}$$



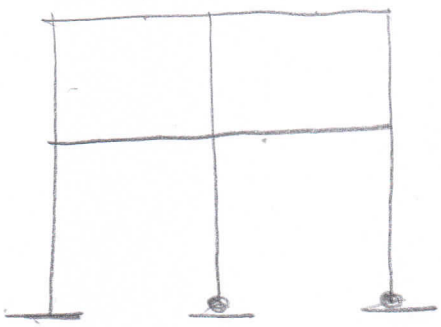


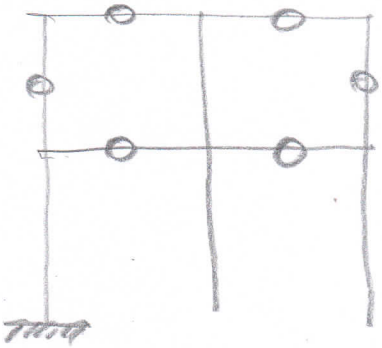




$$M_{max} = 6 \times \frac{1.5}{2} = 4.5 \text{ kNm}$$

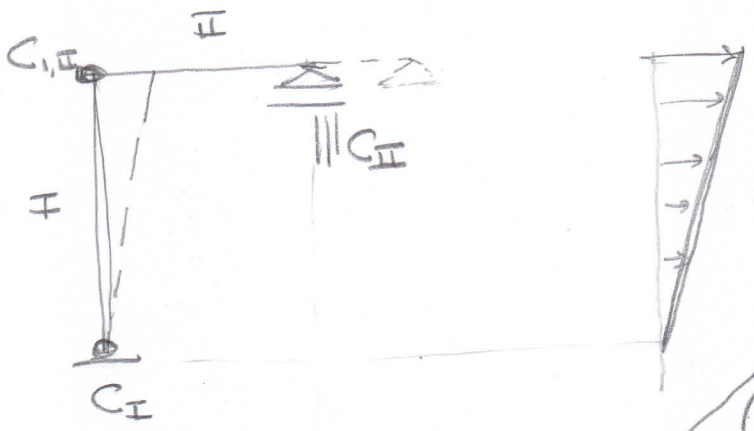
# ES.3



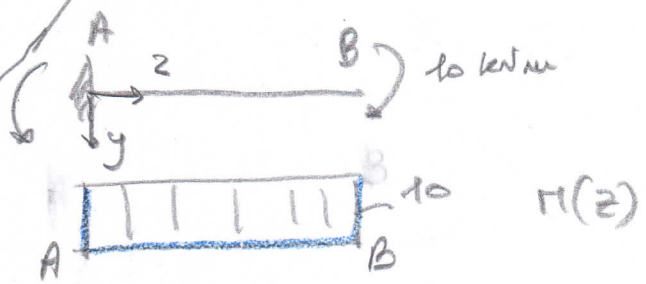
10 kN

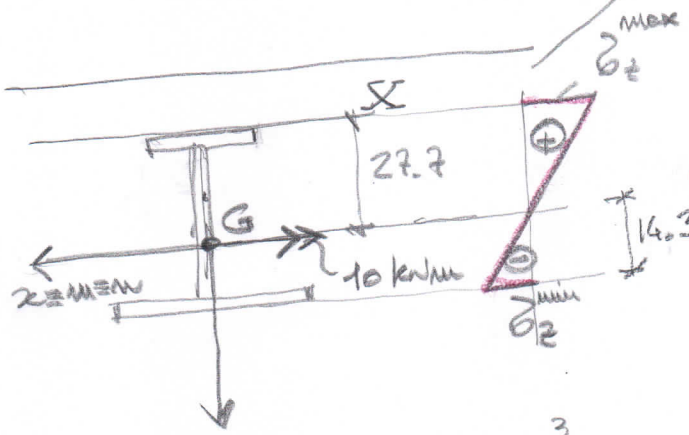


15




# ES.4




$$d = \frac{20\times1\times0.5 + 40\times1\times20.5 + 60\times1\times41.5}{20\times1 + 40\times1 + 60\times1}$$

$$= \frac{3320}{120} = 27.7 \text{ cm}$$

$$I_x = \frac{20\times1^3}{12} + 20\cdot1\times(27.7-0.5)^2 + 1\times\frac{40^3}{12} + 1\times40\times(21-27.7)^2 +$$

$$+ 60\times\frac{1^3}{12} + 60\times1\times(41.5-27.7)^2 = 33359 \text{ cm}^4$$

$$\sigma_z^{max} = -\frac{10\times10^6}{33359\times10^4}\times(-277) = 8.3 \text{ N/mm}^2$$

$$\sigma_z^{min} = -\frac{10\times10^6}{33359\times10^4}\times(420-277) = -4.3 \text{ N/mm}^2$$