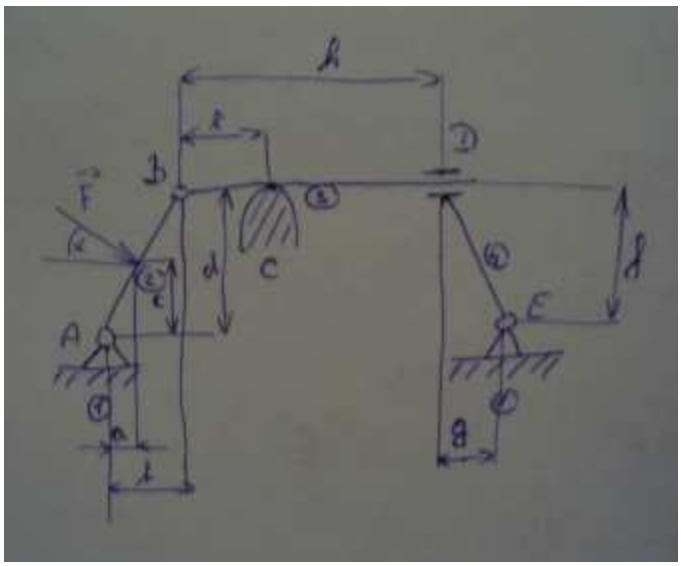
Martin Pavlíček , G51

Příklad č.2
SOUSTAVA TĚLES

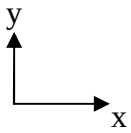
Úkol: Urči stykové síly ve vazbách

1.



Zadané hodnoty:

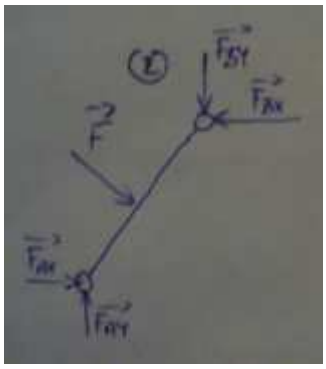
F = 3 N
a = 0,015 m
b = 0,030 m
c = 0,026 m
d = 0,052 m
e = 0,040 m
f = 0,061 m
g = 0,051 m
h = 0,180 m
α = 30°

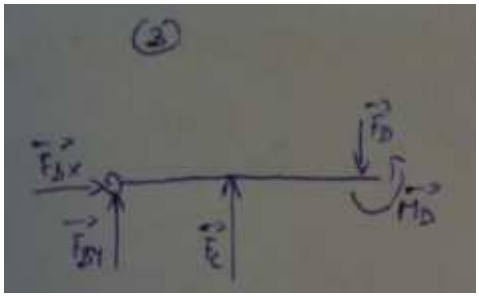


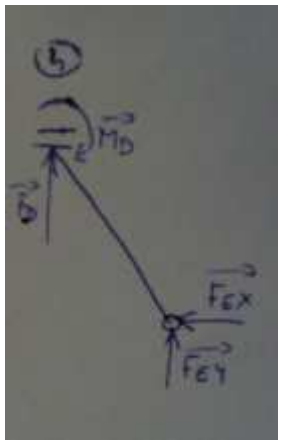
2. Kinematický rozbor:

$i = (n - 1)\cdot i_v - (\Sigma\xi_i - \eta) = (4 - 3) \cdot 3 - (2 + 2 + 2 + 1 + 2) = 9 - 9 = \underline{0} \rightarrow \underline{SR}$

3. Uvolnění







4. Statický rozbor:

$NP = \{F_{AX}, F_{AY}, F_{BX}, F_{BY}, F_C, M_D, F_D, F_{EX}, F_{EY}\}$

$\mu = 9 \quad \mu_F = 8 \quad \mu_M = 1$

$\upsilon = 9 \quad \upsilon_F = 6 \quad \upsilon_M = 1$

$\mu = \upsilon \ \wedge \ \mu_M + \mu_r \leq \upsilon_M$

$\underline{9 = 9} \ \wedge \ 0 + 1 < 3$

$\underline{0 < 3} \rightarrow \underline{\text{STATICKY URČITÁ}}$

5. Řešení :

2. $\Sigma F_X: F_{AX} + F \cdot \cos\alpha - F_{BX} = 0$
   $\Sigma F_Y: F_{AY} - F \cdot \sin\alpha - F_{BY} = 0$
   $\Sigma M_A: - F \cdot \cos\alpha \cdot c - F \cdot \sin\alpha \cdot a - F_{BY} \cdot b + F_{BX} \cdot d = 0$

3. $\Sigma F_X: F_{BX} = 0$
   $\Sigma F_Y: F_{BY} + F_C - F_D = 0$
   $\Sigma M_B: F_C \cdot e - F_D \cdot h + M_D = 0$

4. $\Sigma F_X: - F_{ex} = 0$
   $\Sigma F_Y: F_D + F_{EY} = 0$
   $\Sigma M_E: - M_D - F_D \cdot g = 0$

$F_{BX} =$ **0N**

$F_{EX} =$ **0N**

$F_{AX} = F_{BX} - F \cdot \cos\alpha = 0 - 3 \cdot \cos 30° =$ **-2,6N**

$F_{BY} = (F_{BX} \cdot d - F \cdot \cos\alpha \cdot c - F \cdot \sin\alpha \cdot a) / b = (0 \cdot 0{,}052 - 3 \cdot \cos 30° \cdot 0{,}026 - 3 \cdot \sin 30° \cdot 0{,}015) / 0{,}03 =$
$=$ **-3N**

$F_{AY} = F_{BY} + F \cdot \sin\alpha = -3 + 3 \cdot \sin 30° =$ **-1,5N**

$M_D =$ **$- F_D \cdot g$**
$F_C =$ **$F_D - F_{BY}$**

$(F_D - F_{BY})$ $\cdot e - F_D \cdot h -$ **$F_D \cdot g$** $= 0$
$(F_D + 3) \cdot 0{,}04 - F_D \cdot 0{,}18 - F_D \cdot 0{,}051 = 0$
$0{,}04 \cdot F_D + 0{,}12 - 0{,}18 \cdot F_D - 0{,}051 \cdot F_D = 0$
$0{,}191 \cdot F_D = 0{,}12$
$F_D =$ **0,6N**

$M_D = -0{,}6 \cdot 0{,}051 =$ **0,03Nm**

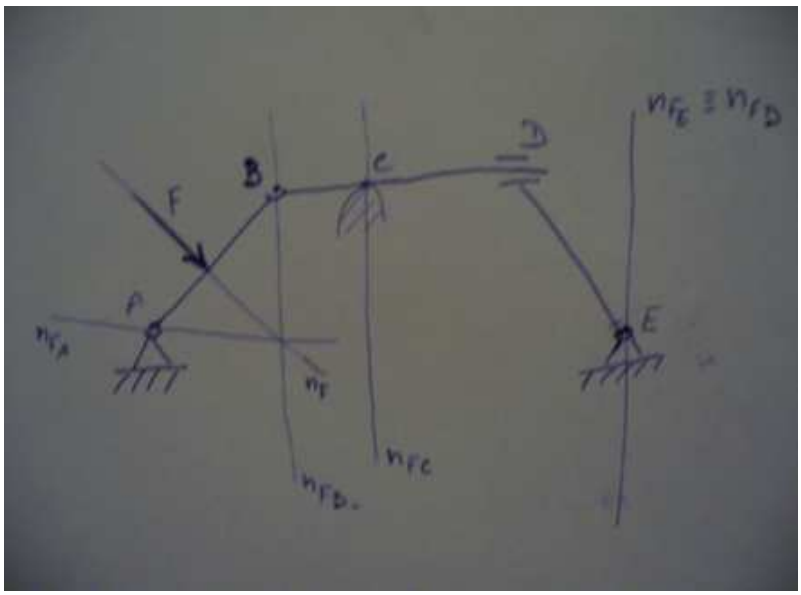
$F_C = 0{,}6 + 3 =$ **3,6N**

$F_{EY} = -F_D =$ **-0,6N**

6. Zhodnocení :

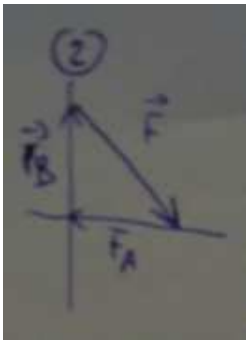
Vazba C je funkční → soustava se opírá o podpěru.

7. Grafické řešení :

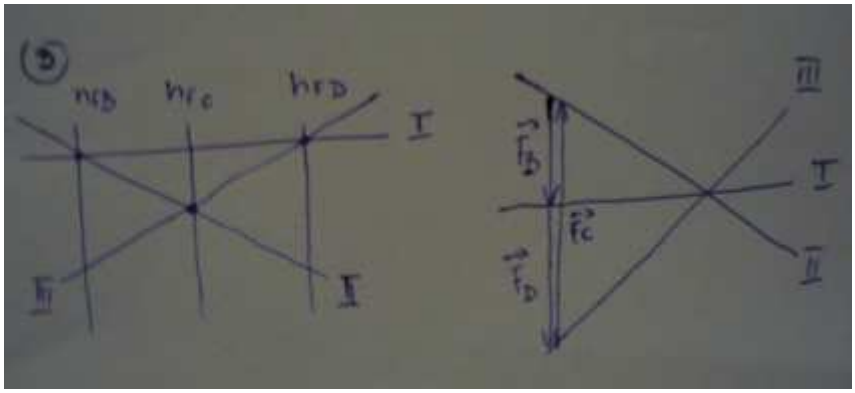


Silový obrazec :

2)



3)



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