TEHNIČKA MEHANIKA

Inženjerstvo zaštite životne sredine

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SISTEM SUČELJENIH SILA - RAVNOTEŽA

- ANALITIČKI USLOV RAVNOTEŽE

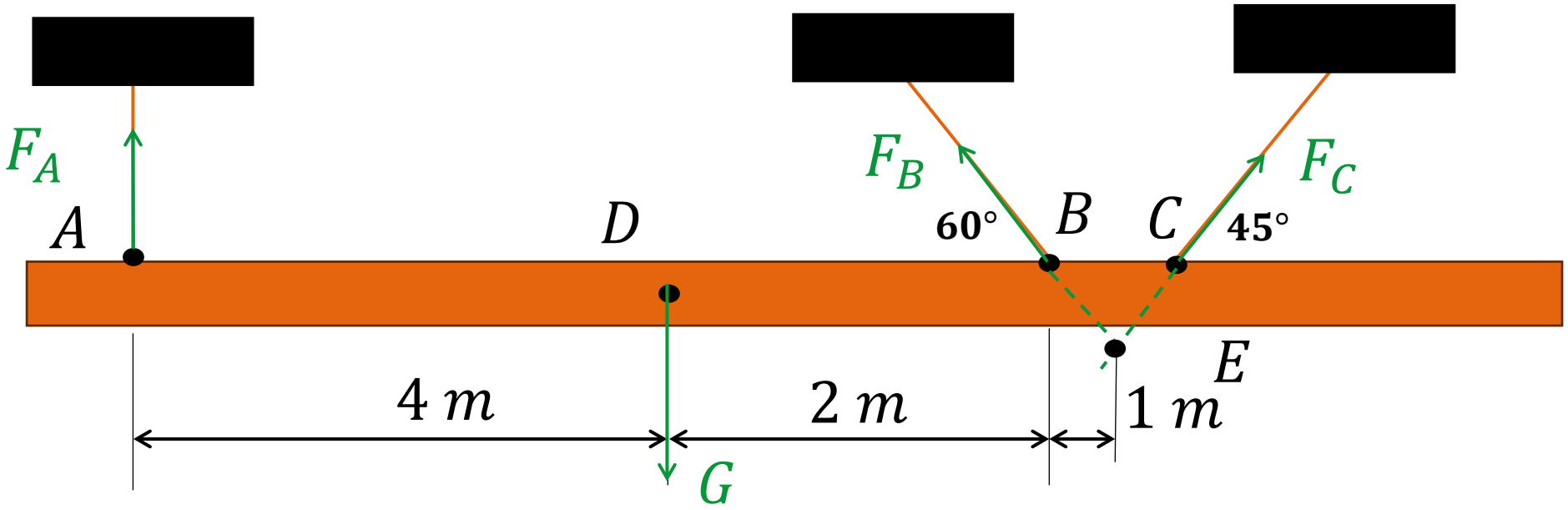
$$\sum_{i=1}^{n} F_i = 0 \quad \longrightarrow \quad \text{može se zameniti rezultantom}$$

$$F_R = 0 \quad \longrightarrow \quad X_R = 0 \qquad Y_R = 0$$

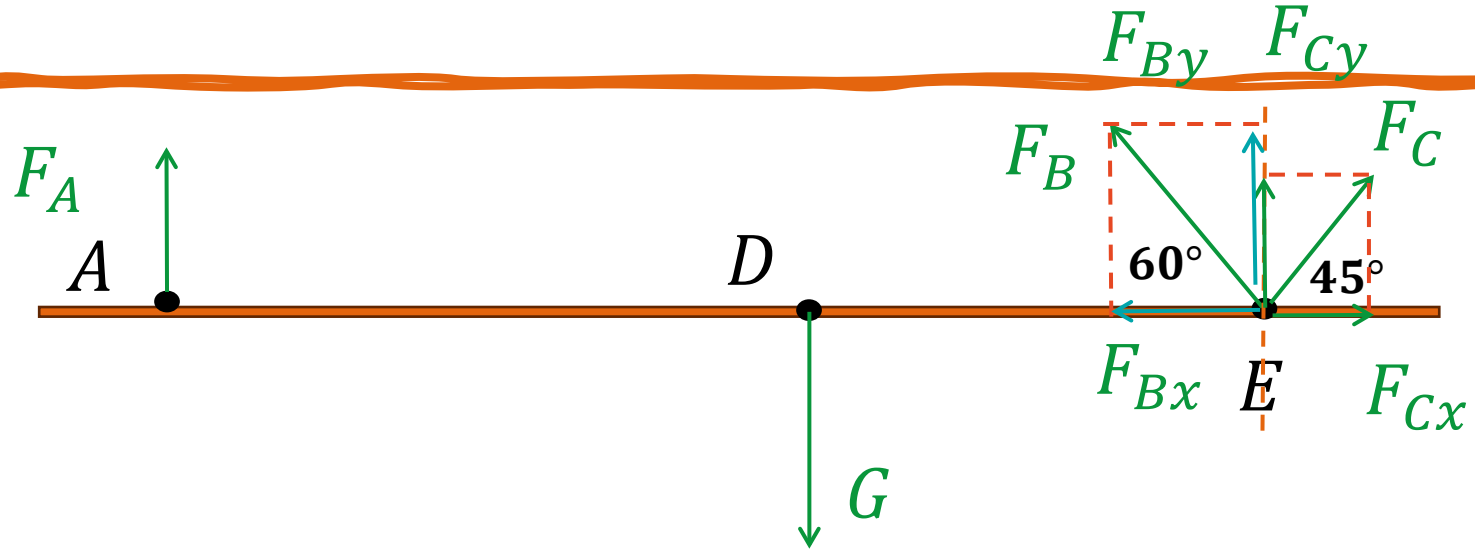
$$\sum_{i=1}^{n} X_i = 0 \qquad \sum_{i=1}^{n} Y_i = 0 \qquad \sum_{i=1}^{n} M_i = 0$$

ZADATAK 1.

- Pri montaži mosta, treba podići deo ABC mostovske konstrukcije pomoću tri užeta. Težina ovog dela konstrukcije je 42kN i napdna tačka D. Odrediti sile u užadima ako je prava ABC horizontalna.



ZADATAK 1.



$$F_{Bx} = F_B * cos60 = \frac{1}{2} F_B \qquad F_{Cx} = F_C * cos45 = \frac{\sqrt{2}}{2} F_C$$

$$F_{By} = F_B * sin60 = \frac{1}{2} F_B \qquad F_{Cy} = F_C * cos45 = \frac{\sqrt{2}}{2} F_C$$

ZADATAK 1.

$$\sum_{i=1}^{n} X_i = 0$$

$$F_{Cx} - F_{Bx} = 0$$

$$\frac{\sqrt{2}}{2} F_C - \frac{1}{2} F_B = 0 \quad / * 2$$

$$\sqrt{2} F_C - F_B = 0$$

$$F_B = \sqrt{2} F_C$$

$$F_C = 12{,}42 kN$$

$$\sum_{i=1}^{n} Y_i = 0$$

$$F_A + F_{By} + F_{Cy} - G = 0$$

$$F_A + \frac{\sqrt{3}}{2} F_B + \frac{\sqrt{2}}{2} F_C - G = 0 \quad / * 2$$

$$2F_A + \sqrt{3} F_B + \sqrt{2} F_C - 2G = 0$$

$$2F_A + \sqrt{3} F_B + \sqrt{2} F_C = 84$$

$$2 * 18 + (\sqrt{3} + 1) F_B = 84$$

$$F_B = 17{,}57 kN$$

$$\sum_{i=1}^{n} M_E = 0$$

$$G * 3 - F_A * 7 = 0$$

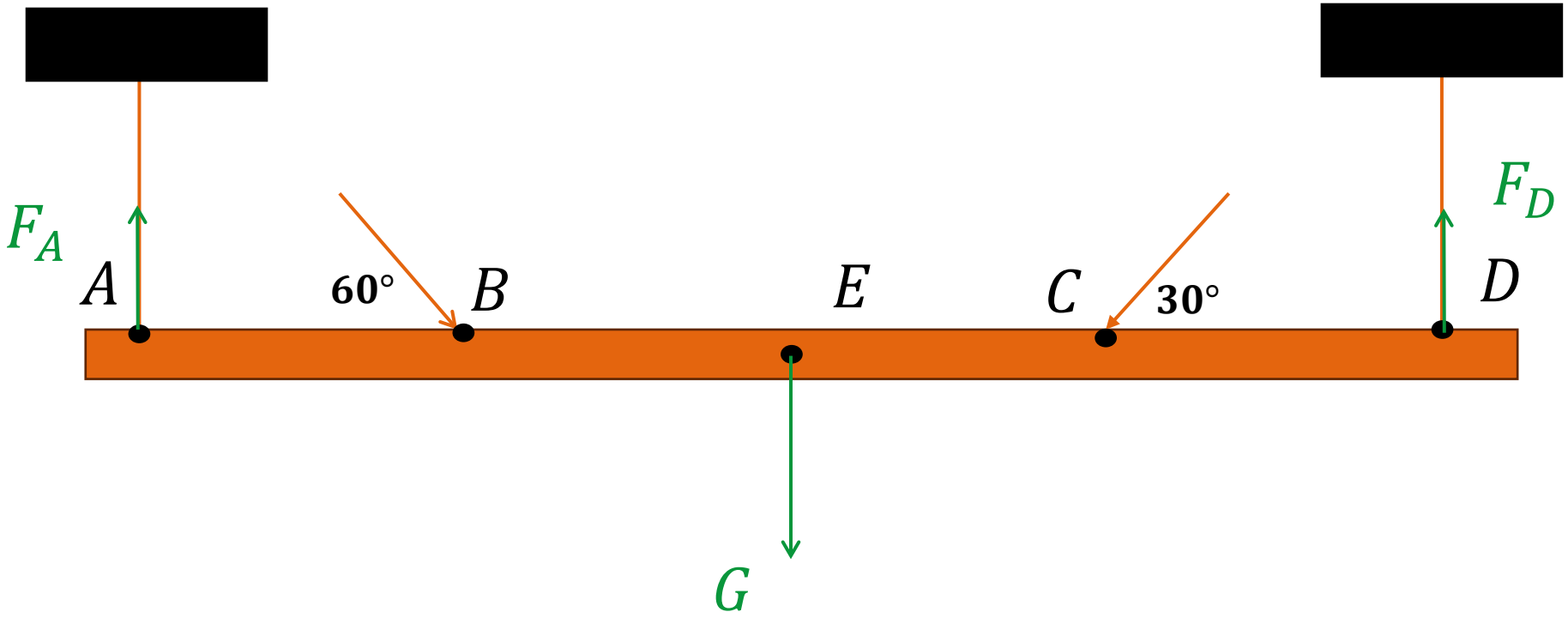
$$F_A * 7 = G * 3$$

$$F_A = \frac{G * 3}{7} = \frac{42 * 3}{7}$$

$$F_A = 18\ kN$$

ZADATAK 2.

- Odrediti sile F_A, F_D i F_B. G=50kN, $F_C = 30kN$.



GRAFOSTATIKA

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- Svako kruto telo koje nosi opterećenje (terete) i prenosi na oslonce, naziva se nosačem.
  - Ravan (ravanski) nosač
  - Prostorni nosač
- Podela:
  - Puni (gredni) nosač
  - Rešetkasti nosači

PUNI NOSAČI

- Prosta greda

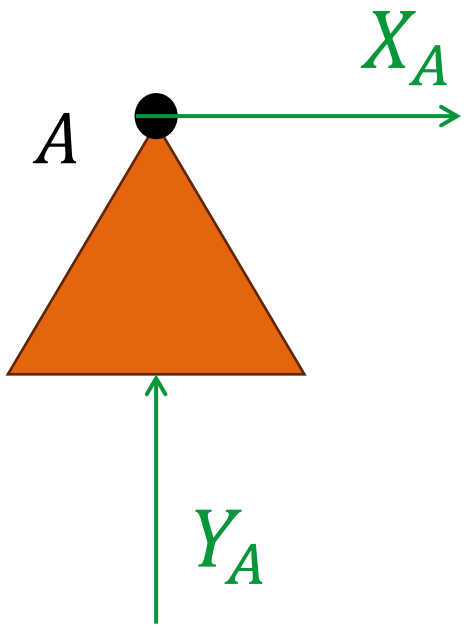
- Konzola

- Greda sa prepustom

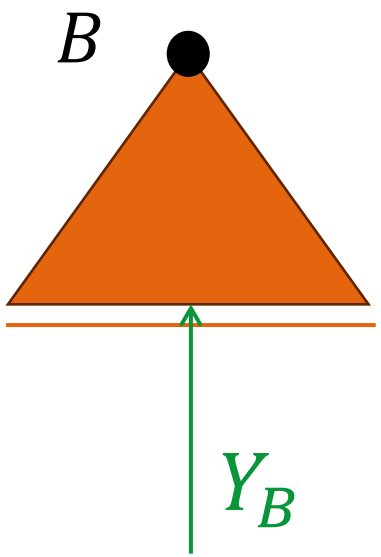
- Ramovski nosač

VRSTE OSLONACA

- Nepokretni oslonac



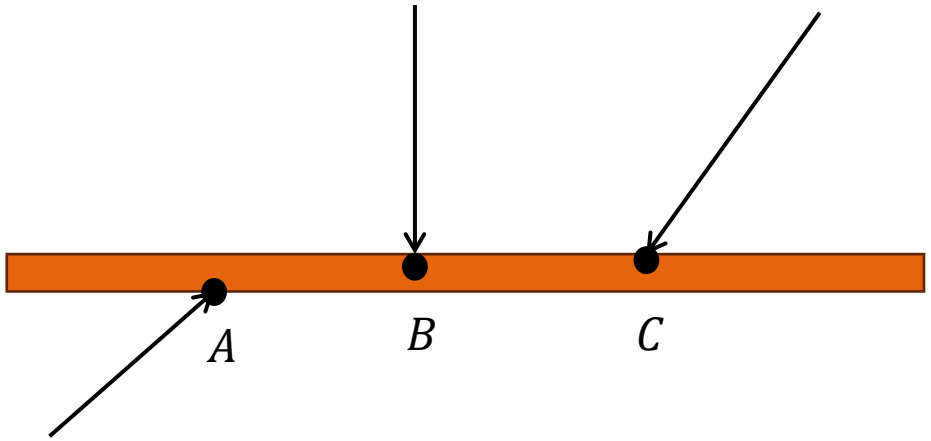
- Pokretni oslonac



VRSTE OPTEREĆENJA

- VRSTE OPTEREĆENJA PREMA OBLIKU

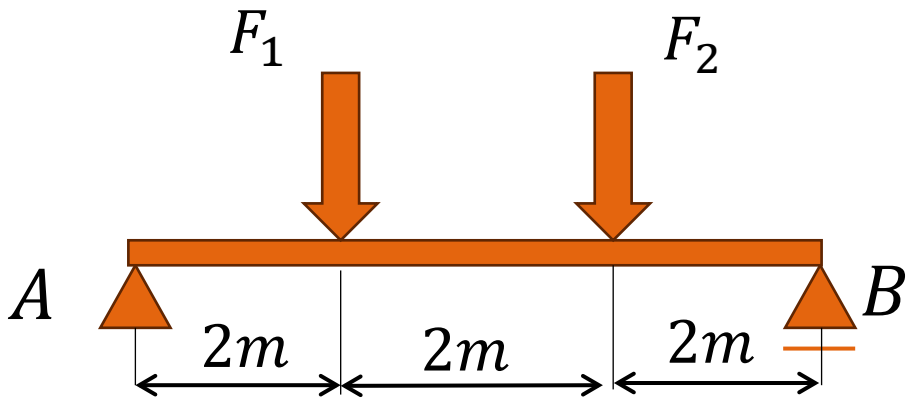
KONCENTRISANA



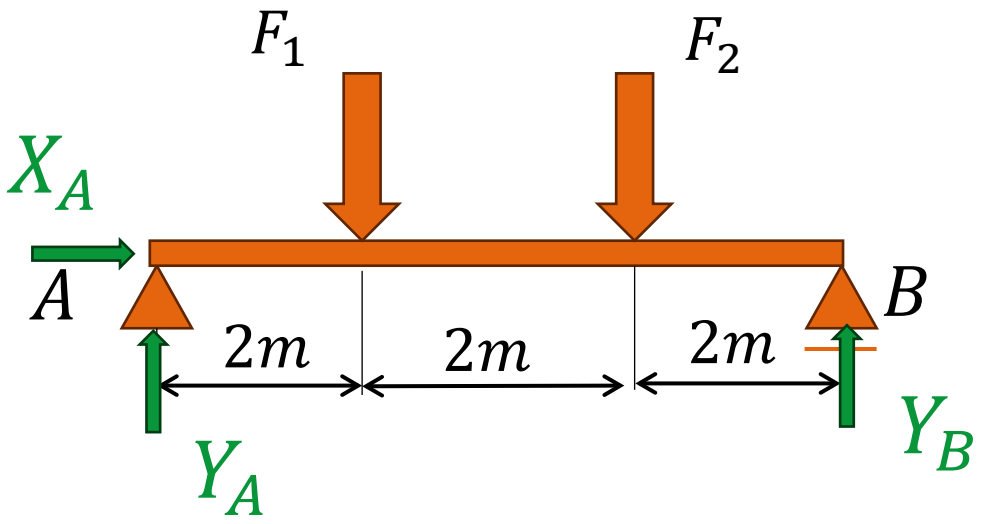
KONTINUALNA

ZADATAK 3.

- Neka je prosta greda AB dužine 6m, u tačkama C i D opterećena vertikalnim koncentrisanim silama $F_1 = 5kN$ *i* $F_2 = 2\ kN,$ prema slici. Analitičkim putem odrediti otpore oslonaca.



ZADATAK 3.



$$\sum_{i=1}^{n} X_i = 0$$

$$X_A = 0$$

$$\sum_{i=1}^{n} Y_i = 0$$

$$Y_B - F_2 - F_1 + Y_A = 0$$

$$Y_B + Y_A = F_1 + F_2$$

$$Y_B + Y_A = 7$$

$$Y_A = 7 - Y_B$$

$$Y_A = 7 - 3$$

$$Y_A = 4\ kN$$

$$\sum_{i=1}^{n} M_A = 0$$

$$+Y_B * 6m - F_2 * 4m - F_1 * 2m = 0$$

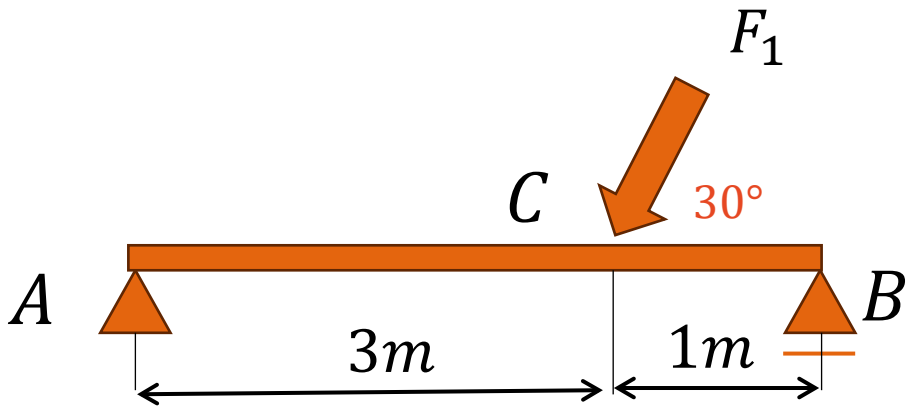
$$Y_B * 6 = F_2 * 4 + F_1 * 2$$

$$Y_B = \frac{F_2 * 4 + F_1 * 2}{6}$$

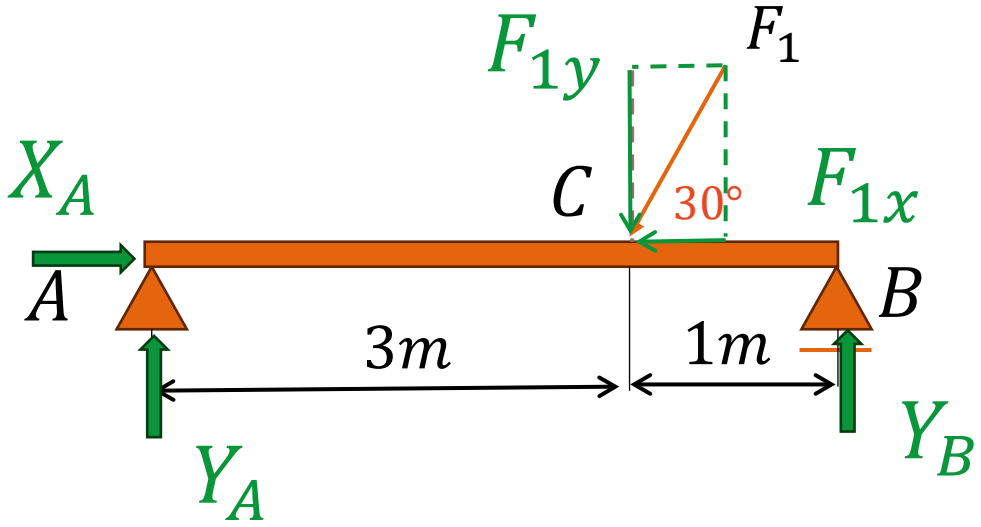
$$Y_B = 3\ kN$$

ZADATAK 4.

- Neka je prosta greda AB dužine 4m, u tački C opterećena kosom koncentrisanom silom $F_1 = 10kN,$ prema slici. Analitičkim putem odrediti otpore oslonaca.



ZADATAK 4.



$$\sum_{i=1}^{n} X_i = 0$$

$$X_A - F_{1x} = 0$$

$$X_A = F_{1x} = 5\sqrt{3}\ kN$$

$$F_{1x} = F_1 * cos30 = 5\sqrt{3}\ kN$$

$$F_{1y} = F_1 * sin30 = 5\ kN$$

$$\sum_{i=1}^{n} Y_i = 0$$

$$Y_B - F_{1y} + Y_A = 0$$

$$Y_B + Y_A = F_{1y}$$

$$Y_B + Y_A = 5$$

$$Y_A = 5 - Y_B$$

$$Y_A = 5 - 3{,}75$$

$$Y_A = 1{,}25\ kN$$

$$\sum_{i=1}^{n} M_A = 0$$

$$Y_B * 4m - F_{1y} * 3m = 0$$

$$Y_B * 4 = F_{1y} * 3$$

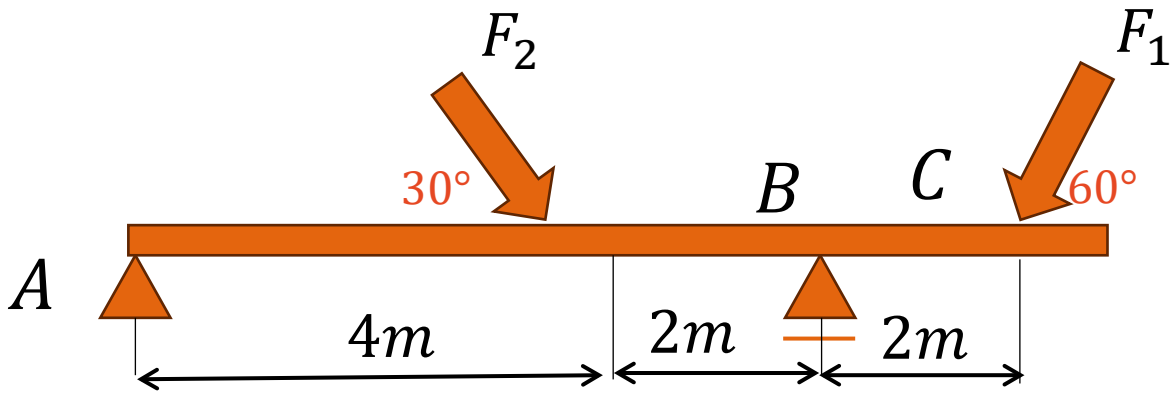
$$Y_B = \frac{F_{1y} * 3}{4}$$

$$Y_B = \frac{5 * 3}{4}$$

$$Y_B = 3{,}75\ kN$$

ZADATAK 5.

- Neka je prosta greda AB dužine 4m, u tački C opterećena kosom koncentrisanom silom $F_1 = 10kN$ *i* $F_2 = 6\ kN,$ prema slici. Analitičkim putem odrediti otpore oslonaca.



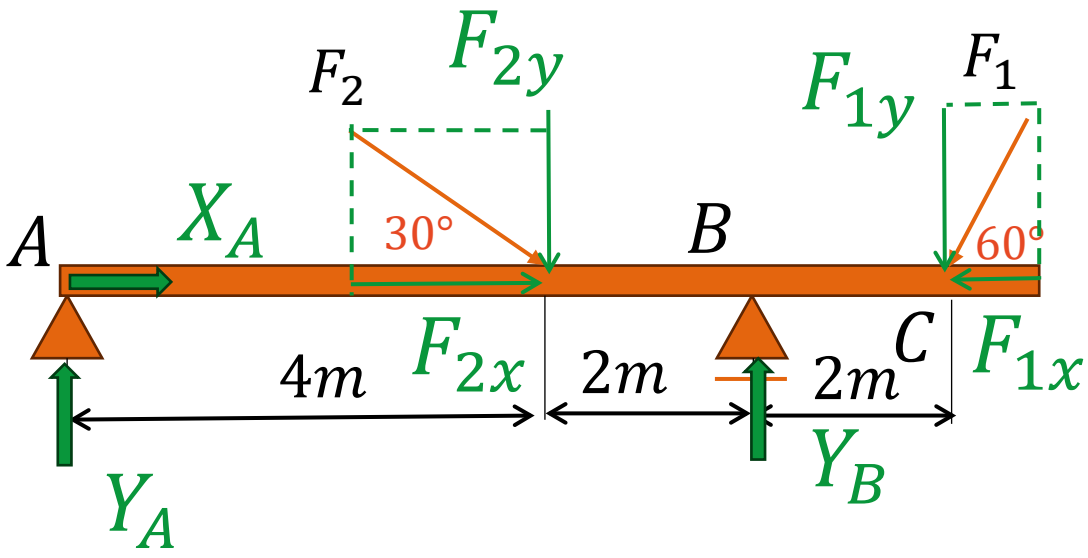
$$F_{1x} = F_1 * cos60 = 5\ kN$$

$$F_{1y} = F_1 * sin60 = 5\sqrt{3} kN$$

ZADATAK 5.

$$F_{2x} = F_2 * cos30 = 3\sqrt{3}\ kN$$

$$F_{2y} = F_2 * sin30 = 3\ kN$$



$$\sum_{i=1}^{n} X_i = 0$$

$$X_A - F_{1x} + F_{2x} = 0$$

$$X_A = F_{1x} - F_{2x} = -0.196kN$$

$$\sum_{i=1}^{n} Y_i = 0$$

$$Y_B - F_{1y} - F_{2y} + Y_A = 0$$

$$Y_B + Y_A = F_{1y} + F_{2y}$$

$$Y_B + Y_A = 11{,}66$$

$$Y_A = 11{,}66 - Y_B$$

$$Y_A = 11{,}66 - 13{,}547$$

$$Y_A = -1{,}887kN$$

$$\sum_{i=1}^{n} M_A = 0$$

$$Y_B * 6m - F_{1y} * 8m - F_{2y} * 4m = 0$$

$$Y_B * 6 = F_{1y} * 8 + F_{2y} * 4$$

$$Y_B = \frac{F_{1y} * 8 + F_{2y} * 4}{6}$$

$$Y_B = \frac{5\sqrt{3} * 8 + 3 * 4}{6}$$

$$Y_B = 13{,}547\ kN$$

HVALA NA PAŽNJI!

PITANJA?