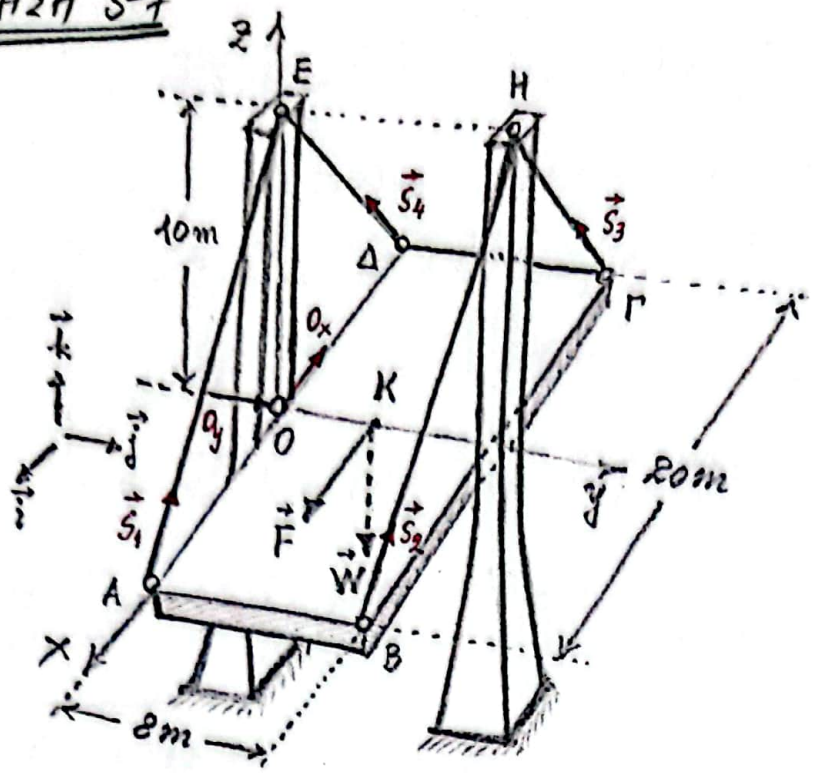
ΑΣΚΗΣΗ 3-7



Δίνονται:

Ζητούνται:

K: κεντροειδές $\therefore$ $OK = 4m$, $F = 40\,kN$, $W = 120\,kN$, $S_2 = ?$, $S_3 = ?$

$$\vec{e}_{BH} = -\frac{\sqrt{2}}{2}\vec{i} + \frac{\sqrt{2}}{2}\vec{k}, \quad \vec{S}_2 = \frac{S_2\sqrt{2}}{2}(-\vec{i}+\vec{k})$$

$$\vec{e}_{\Gamma H} = \frac{\sqrt{2}}{2}\vec{i} + \frac{\sqrt{2}}{2}\vec{k}, \quad \vec{S}_3 = \frac{S_3\sqrt{2}}{2}(\vec{i}+\vec{k})$$

$$M_{A\Delta}^{S_2} = \vec{M}_A^{S_2}\cdot\vec{i} = (\vec{AB}\times\vec{S}_2)\cdot\vec{i} = \left[8\vec{j}\times\frac{S_2\sqrt{2}}{2}(-\vec{i}+\vec{k})\right]\cdot\vec{i} =$$

$$= 4S_2\sqrt{2}(\vec{k}+\vec{i})\cdot\vec{i} = \underline{4S_2\sqrt{2}}$$

$$M_{A\Delta}^{S_3} = \vec{M}_\Delta^{S_3}\cdot\vec{i} = (\vec{\Delta\Gamma}\times\vec{S}_3)\cdot\vec{i} = \left[8\vec{j}\times\frac{S_3\sqrt{2}}{2}(\vec{i}+\vec{k})\right]\cdot\vec{i} =$$

$$= 4S_3\sqrt{2}(-\vec{k}+\vec{i})\cdot\vec{i} = \underline{4S_3\sqrt{2}}$$

$$M_{A\Delta}^{W} = \vec{M}_O^{W}\cdot\vec{i} = (\vec{OK}\times\vec{W})\cdot\vec{i} = \left[4\vec{j}\times(-120\vec{k})\right]\cdot\vec{i} =$$

$$= -480\,\vec{i}\cdot\vec{i} = \underline{-480}$$

$$M_{A\Delta}^{S_2,S_3,W} = 4S_2\sqrt{2} + 4S_3\sqrt{2} - 480 \equiv 0 \Rightarrow \boxed{S_2+S_3 = \frac{480}{4\sqrt{2}} = \frac{120\sqrt{2}}{2\sqrt{2}} = 60\sqrt{2}} \quad (1)$$

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$$M_{OE}^{S_2} = \vec{M}_E^{S_2} \cdot \vec{k} = (\vec{EH} \times \vec{S_2}) \cdot \vec{k} = \left[8\vec{j} \times \frac{S_2\sqrt{2}}{2}(-\vec{i}+\vec{k})\right] \cdot \vec{k} =$$

$$= (\text{ομοια με πριν}) = 4S_2\sqrt{2}(\vec{k}+\vec{i}) \cdot \vec{k} = \underline{4S_2\sqrt{2}}$$

$$M_{OE}^{S_3} = \vec{M}_E^{S_3} \cdot \vec{k} = (\vec{EH} \times \vec{S_3}) \cdot \vec{k} = \left[8\vec{j} \times \frac{S_3\sqrt{2}}{2}(\vec{i}+\vec{k})\right] \cdot \vec{k} =$$

$$(\text{ομοιως}) = 4S_3\sqrt{2}(-\vec{k}+\vec{i}) \cdot \vec{k} = \underline{-4S_3\sqrt{2}}$$

$$M_{OE}^{F} = \vec{M}_O^F \cdot \vec{k} = (\vec{OK} \times \vec{F}) \cdot \vec{k} = (4\vec{j} \times 40\vec{i}) \cdot \vec{k} = -160\vec{k} \cdot \vec{k} = \underline{-160}$$

$$M_{OE}^{S_2,S_3,F} = 4S_2\sqrt{2} - 4S_3\sqrt{2} - 160 = 0 \Rightarrow \boxed{S_2 - S_3 = \frac{160}{4\sqrt{2}} = \frac{40\sqrt{2}}{\sqrt{2}\sqrt{2}} = 20\sqrt{2}} \quad (2)$$

$$(1) + (2) \rightarrow 2S_2 = 80\sqrt{2} \Rightarrow \boxed{S_2 = 40\sqrt{2}\ kN} \quad (3)$$

$$(2), (3) \rightarrow S_3 = 60\sqrt{2} - 40\sqrt{2} \Rightarrow \boxed{S_3 = 20\sqrt{2}\ kN} \quad (4)$$

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