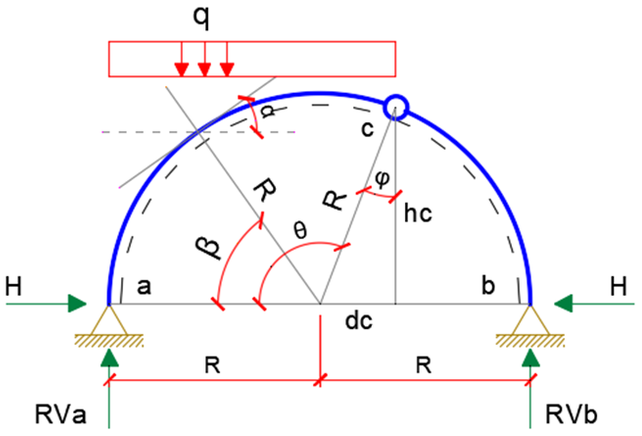
B2T4N0519A

Considerando o modelo estrutural esboçado, responda os questionamentos.

$R := 5\ \text{m}$

$\theta := 100\ °$

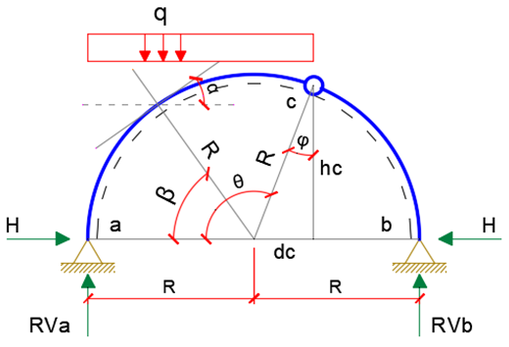
$q := 40\ \frac{\text{kN}}{\text{m}}$



OBS: Todas as respostas devem ser dadas com sinal respeitando a convenção de diagramas
Q01) Qual o valor do esforço cortante em β = 30° ? [em kN]
Q02) Qual o valor do esforço axial em β = 30° ? [em kN]
Q03) Qual o valor do momento fletor em β = 30°? [em kNm]
Q04) Qual o valor do esforço cortante em β = 125° ? [em kN]
Q05) Qual o valor do esforço axial em β = 125° ? [em kN]
Q06) Qual o valor do momento fletor em β = 125° ? [em kNm]

DICA : Manter a origem do sistema sempre no ponto "a" - não reiniciar a origem para cada trecho de análise.

Reações de Apoio :



$\varphi := \theta - 90\ ° = 10\ °$

$hc := R \cdot \cos(\varphi) = 4,924\ \text{m}$

$dc := R \cdot \sin(\varphi) = 0,8682\ \text{m}$

ΣMa = 0 (+) antihorário

$RVb \cdot 2 \cdot R - q \cdot \frac{(R + dc)^2}{2} = 0$

$RVb := \frac{1}{2 \cdot R} \cdot q \cdot \frac{(R + dc)^2}{2} = 68,873\ \text{kN}$

ΣFV = 0 (+) para cima

$RVa + RVb - q \cdot (R + dc) = 0$

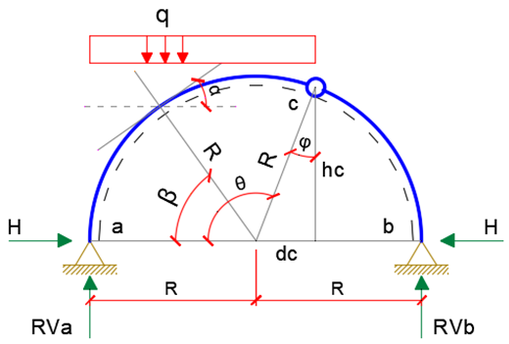
$RVa := -RVb + q \cdot (R + dc) = 165,86\ \text{kN}$

ΣMc = 0 (+) horário "olhando para "b"

$H \cdot hc - RVb \cdot (R - dc) = 0$

$H := \frac{RVb \cdot (R - dc)}{hc} = 57,791\ \text{kN}$

Equações de Esforços :

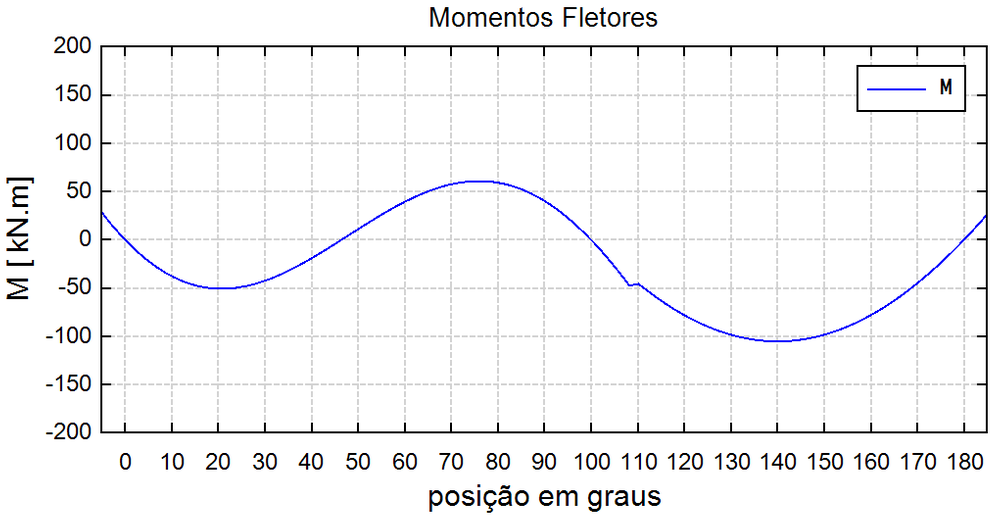


$x := R - R \cdot \cos(\beta)$ $\quad y := R \cdot \sin(\beta)$

$M_ac(\beta) := RVa \cdot x - \frac{q \cdot x^2}{2} - H \cdot y$

$M_cb(\beta) := RVa \cdot x - q \cdot (R + dc) \cdot \left(x - \frac{(R + dc)}{2} \right) - H \cdot y$

$M(\beta) := \text{if } \beta < 110$
$\quad M_ac(\beta\ °)$
$\quad \text{else}$
$\quad M_cb(\beta\ °)$



$\Sigma VER_ac(x) := RVa - q \cdot x$ $\quad \Sigma VER_cb(x) := RVa - q \cdot (R + dc)$

$\Sigma HOR_ac(y) := H$ $\quad \Sigma HOR_cb(y) := H$

$\alpha(\beta) := 90\ ° - \beta$

$V(\alpha) = \Sigma VER.\cos\alpha - \Sigma HOR.\text{sen}\alpha$
$N(\alpha) = -\Sigma VER.\text{sen}\alpha - \Sigma HOR.\cos\alpha$

$V_ac(\beta) := \Sigma VER_ac(x) \cdot \cos(\alpha(\beta)) - \Sigma HOR_ac(y) \cdot \sin(\alpha(\beta))$

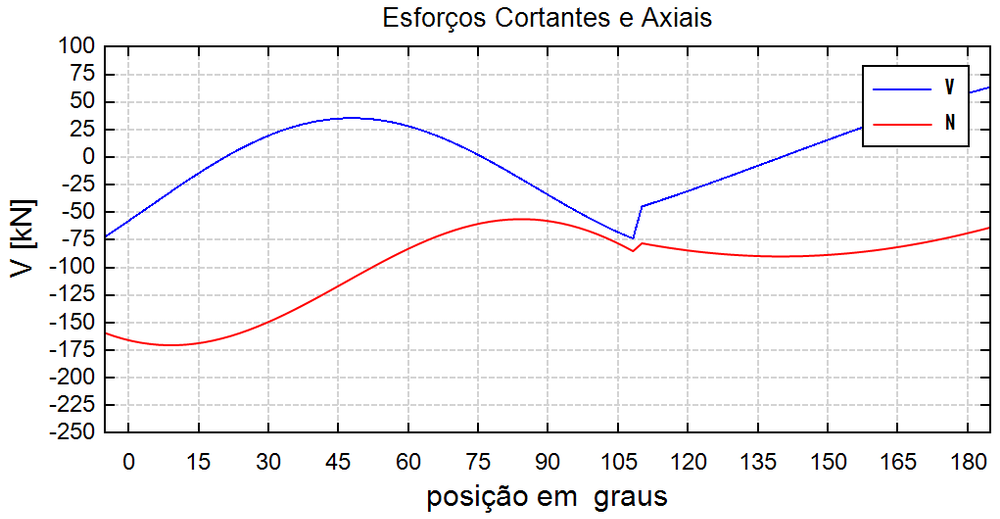
$N_ac(\beta) := -\Sigma VER_ac(x) \cdot \sin(\alpha(\beta)) - \Sigma HOR_ac(y) \cdot \cos(\alpha(\beta))$

$V_cb(\beta) := \Sigma VER_cb(x) \cdot \cos(\alpha(\beta)) - \Sigma HOR_cb(y) \cdot \sin(\alpha(\beta))$

$N_cb(\beta) := -\Sigma VER_cb(x) \cdot \sin(\alpha(\beta)) - \Sigma HOR_cb(y) \cdot \cos(\alpha(\beta))$

$V(\beta) := \text{if } \beta < 110$
$\quad V_ac(\beta\ °)$
$\quad \text{else}$
$\quad V_cb(\beta\ °)$

$N(\beta) := \text{if } \beta < 110$
$\quad N_ac(\beta\ °)$
$\quad \text{else}$
$\quad N_cb(\beta\ °)$



$Q01 := V(30) = 19,483\ \text{kN}$

$Q02 := N(30) = -149,33\ \text{kN}$

$Q03 := M(30) = -42,349\ \text{kN m}$

$Q04 := V(125) = -23,270\ \text{kN}$

$Q05 := N(125) = -86,843\ \text{kN}$

$Q06 := M(125) = -89,853\ \text{kN m}$
