B1T4MA0831B

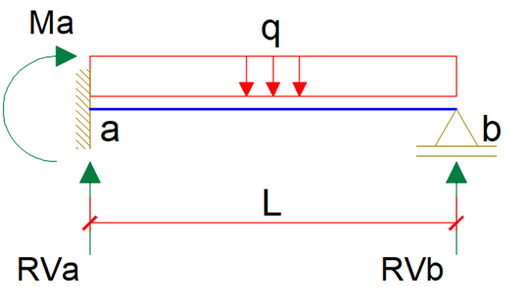
Empregando o método das forças calcule o máximo momento fletor que ocorre na viga respondendo os questionamentos.

* Adotar obrigatoriamente a reação de momento fletor no ponto "a" como redudante hiperestática.

Q01) Qual o valor do deslocamento de rotação que ocorre no ponto "a" do caso 0 de carregamento [em rad e em módulo]?
Q02) Qual o valor do deslocamento de rotação que ocorre no ponto "a" do caso 1 de carregamento [em rad e em módulo]?
Q03) Qual o valor da reação de momento fletor no ponto "a" do caso real [kNm positivo para horário]?
Q04) Qual o máximo momento fletor que ocorre na viga [em kNm]?

$q := 30,0 \ \frac{kN}{m}$ $L := 6,0 \ m$

$E := 15 \ GPa$

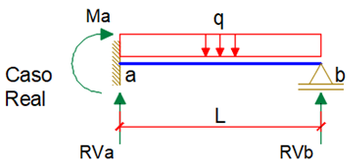


Dimensões da seção transversal retangular:

$b := 20 \ cm$ $h := 40 \ cm$

** Considerar nos cálculos somente efeitos de flexão;

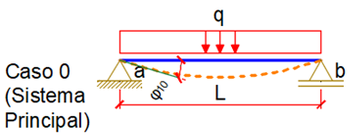
Solução via Método das Forças (MF) com Integração da Linha Elástica:

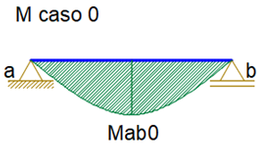


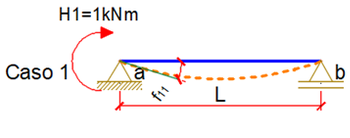
$EI := \frac{E \cdot b \cdot h^3}{12} = 16000 \ kN \ m^2$ $H1 := 1 \ kN \ m$

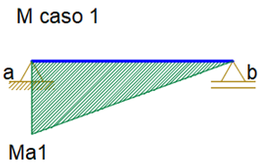
$Mab0 := \frac{q \cdot L^2}{8} = 135 \ kN \ m$

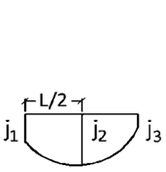
$Ma1 := H1 = 1 \ kN \ m$

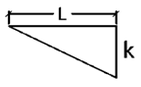








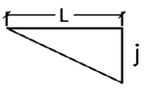


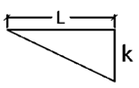


1/6 Lk(2j2+j3)

$k := Ma1$ $j_2 := Mab0$ $j_3 := 0$

$\delta_{10} := \frac{1}{EI} \cdot \frac{1}{6} \cdot L \cdot k \cdot \left(2 \cdot j_2 + j_3\right) \cdot \frac{1}{H1} = 0,016875$





1/3 Ljk

$k := Ma1$ $j := Ma1$

$f_{11} := \frac{1}{EI} \cdot \frac{1}{3} \cdot L \cdot j \cdot k \cdot \frac{1}{H1} = 0,000125$

Condição e Compatibilidade: $\delta_{10} + MVa \cdot f_{11} = 0$ ---> $MVa := \frac{-\delta_{10}}{f_{11}} \cdot 1\ \text{kN m} = -135\ \text{kN m}$

Cálculo de RVa caso real: $\Sigma Mb = 0$ ---> $RVa \cdot L + MVa - \frac{q \cdot L^2}{2} = 0$ ---> $RVa := \frac{1}{L} \cdot \left(-MVa + \frac{q \cdot L^2}{2} \right) = 112,5\ \text{kN}$

Equação de Momentos Fletores da Viga: $Mab(x) := RVa \cdot x - \frac{q \cdot x^2}{2} + MVa$

posição de valor extremo de Mba(x) $\frac{dMba(x)}{dx} = 0$

$RVa - q \cdot x = 0$ ---> $x_ext := \frac{RVa}{q} = 3,75\ \text{m}$

$Mab(x_ext) = 75,938\ \text{kN m}$ $Mab(0) = -135\ \text{kN m}$ $Mab(L) = 0\ \text{kN m}$

$Q01 := |\delta_{10}| = 0,016875$

$Q02 := |f_{11}| = 0,000125$

$Q03 := MVa = -135\ \text{kN m}$

$Q04 := Mab(x_ext) = 75,9375\ \text{kN m}$
