

$vif()$

Nodos(x,y)

$$\begin{bmatrix} "x" \\ "y" \end{bmatrix} \begin{bmatrix} 0 & -1732 & 8.66033E2 \\ 0 & 9.99973E2 & 2.49993E3 \end{bmatrix}$$

Conectividad(xi,xf)

$$\begin{bmatrix} "ni" \\ "nf" \end{bmatrix} \begin{bmatrix} 1 & 2 \\ 2 & 3 \end{bmatrix}$$

Datos (Area,E,Iner)

$$\begin{bmatrix} "Area" \\ "E" \end{bmatrix} \begin{bmatrix} 400 & 400 \\ 70000 & 70000 \end{bmatrix}$$

$$\begin{bmatrix} "Inercia" \end{bmatrix} \begin{bmatrix} 0 & 0 \end{bmatrix}$$

MR Elemento 1

$$\begin{bmatrix} 1.05003E4 & -6.06236E3 & 0.E0 & -1.05003E4 & 6.06236E3 & 0.E0 \\ -6.06236E3 & 3.50011E3 & 0.E0 & 6.06236E3 & -3.50011E3 & 0.E0 \\ 0.E0 & 0.E0 & 0.E0 & 0.E0 & 0.E0 & 0.E0 \\ -1.05003E4 & 6.06236E3 & 0.E0 & 1.05003E4 & -6.06236E3 & 0.E0 \\ 6.06236E3 & -3.50011E3 & 0.E0 & -6.06236E3 & 3.50011E3 & 0.E0 \\ 0.E0 & 0.E0 & 0.E0 & 0.E0 & 0.E0 & 0.E0 \end{bmatrix}$$

MR Elemento 2

$$\begin{bmatrix} 7.00018E3 & 4.04151E3 & 0.E0 & -7.00018E3 & -4.04151E3 & 0.E0 \\ 4.04151E3 & 2.33334E3 & 0.E0 & -4.04151E3 & -2.33334E3 & 0.E0 \\ 0.E0 & 0.E0 & 0.E0 & 0.E0 & 0.E0 & 0.E0 \\ -7.00018E3 & -4.04151E3 & 0.E0 & 7.00018E3 & 4.04151E3 & 0.E0 \\ -4.04151E3 & -2.33334E3 & 0.E0 & 4.04151E3 & 2.33334E3 & 0.E0 \\ 0.E0 & 0.E0 & 0.E0 & 0.E0 & 0.E0 & 0.E0 \end{bmatrix}$$

MR Ensamble

$$\begin{bmatrix} 1.05003E4 & -6.06236E3 & 0.E0 & -1.05003E4 & 6.06236E3 & 0.E0 & 0 & 0 & 0 \\ -6.06236E3 & 3.50011E3 & 0.E0 & 6.06236E3 & -3.50011E3 & 0.E0 & 0 & 0 & 0 \\ 0.E0 & 0.E0 & 0.E0 & 0.E0 & 0.E0 & 0.E0 & 0 & 0 & 0 \\ -1.05003E4 & 6.06236E3 & 0.E0 & 1.75005E4 & -2.02085E3 & 0.E0 & -7.00018E3 & -4.04151E3 & 0.E0 \\ 6.06236E3 & -3.50011E3 & 0.E0 & -2.02085E3 & 5.83345E3 & 0.E0 & -4.04151E3 & -2.33334E3 & 0.E0 \\ 0.E0 & 0.E0 & 0.E0 & 0.E0 & 0.E0 & 0.E0 & 0.E0 & 0.E0 & 0.E0 \\ 0 & 0 & 0 & -7.00018E3 & -4.04151E3 & 0.E0 & 7.00018E3 & 4.04151E3 & 0.E0 \\ 0 & 0 & 0 & -4.04151E3 & -2.33334E3 & 0.E0 & 4.04151E3 & 2.33334E3 & 0.E0 \\ 0 & 0 & 0 & 0.E0 & 0.E0 & 0.E0 & 0.E0 & 0.E0 & 0.E0 \end{bmatrix}$$

Q conocidos

$$Q \text{ GDL} \begin{bmatrix} 1 & 2 & 3 & 7 & 8 & 9 \end{bmatrix}$$

$$\text{Valor GDL} \begin{bmatrix} 0 & 0 & 0 & 0 & 0 & 0 \end{bmatrix}$$

F conocidos

$$F \text{ GDL} \begin{bmatrix} 4 & 5 & 3 \end{bmatrix}$$

$$\text{Valor F} \begin{bmatrix} 0 & -20000 & 0 \end{bmatrix}$$

KAA (Q con)

$$\begin{bmatrix} 1.75005E4 & -2.02085E3 & 0.E0 \\ -2.02085E3 & 5.83345E3 & 0.E0 \\ 0.E0 & 0.E0 & 0.E0 \end{bmatrix}$$

KAB (Q desco)

$$\begin{bmatrix} -1.05003\text{E}4 & 6.06236\text{E}3 & 0.\text{E}0 & -7.00018\text{E}3 & -4.04151\text{E}3 & 0.\text{E}0 \\ 6.06236\text{E}3 & -3.50011\text{E}3 & 0.\text{E}0 & -4.04151\text{E}3 & -2.33334\text{E}3 & 0.\text{E}0 \\ 0.\text{E}0 & 0.\text{E}0 & 0.\text{E}0 & 0.\text{E}0 & 0.\text{E}0 & 0.\text{E}0 \end{bmatrix}$$

Q desconocidos

$$\begin{bmatrix} -4.12401\text{E}-1 \\ -3.57137\text{E}0 \\ 0.\text{E}0 \end{bmatrix}$$

Q solution

$$\begin{bmatrix} 0 & 0 & 0 & -4.12401\text{E}-1 & -3.57137\text{E}0 & 0.\text{E}0 & 0 & 0 & 0 \end{bmatrix}$$

Fext nodos

$$\begin{bmatrix} -1.73206\text{E}4 & 1.00001\text{E}4 & 0.\text{E}0 & 1.\text{E}-10 & -2.\text{E}4 & 0.\text{E}0 & 1.73206\text{E}4 & 9.99993\text{E}3 & 0.\text{E}0 \end{bmatrix}$$

Done



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Define LibPub vif()=
Prgm
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©Universidad de Santiago de Chile
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©Modulo E[MPa]
©Inercia[mm4]
©Area[mm2]
©Torque[N·mm]
©Fuerza[N]
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©Sistema de Unidades EG
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©L[in]
©Modulo E[psi]
©Inercia[in4]
©Area[in2]
©Torque[lb·in]
©Fuerza[lb]
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ClearAZ
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©Definir variables
©-----
Local n,b,i,ni,nf,nn,nii,nff,j,h,hh,gdl1,gdl2
Local le,c,s
Local xn,yn
Local area,eyoung,largox,sigmaf
Local iner
Local ii,jj,cont,cont2
©-----
©Entrada de datos
©-----
Request "Numero Nodos",n,0
Request "Numero Vigas/Barras",b,0
Request "Q Conocidos",desp,0
Request "F o M Conocidas",load,0
nn:=n·3
©-----
©Crear memoria matrices
©-----
newMat(n,2)→nodos
newMat(b,2)→datosn
newMat(b,5)→datos
newMat(nn,nn)→mrk
newMat(6,6)→kb
newList(6)→gdl

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newMat(desp,1)→mdesp1
newMat(desp,1)→mdesp2
newMat(load,1)→mload1
newMat(load,1)→mload2
newMat(nn-desp,nn-desp)→kprim
newMat(nn-desp,desp)→kab
newMat(nn,1)→ff
newMat(nn-desp,1)→fa
newMat(nn-desp,1)→qqprima
newMat(nn-desp,1)→ffprimagauss1
newMat(nn,1)→qq
©-----
©Coordenadas Nodos
©-----
For i,1,n
  Request "(x)Pos Nodo",xn,0
  Request "(y)Pos Nodo",yn,0
  nodos[i,1]:=xn
  nodos[i,2]:=yn
EndFor
Disp "Nodos(x,y)"
Disp ["x",nodos']
Disp ["y"]
©-----
©Matriz conectividad y Datos
©-----
©Datos carac :Area,E,L,sigmaf
©-----
For i,1,b
  Request "Nodo ni/1",nii,0
  Request "Nodo nf/2",nff,0
  Request "Area",area,0
  Request "E",eyoung,0
  Request "Inercia",iner,0
  datosn[i,1]:=nii
  datosn[i,2]:=nff
  datos[i,1]:=area
  datos[i,2]:=eyoung
  ©datos[i,3]:=largox
  ©datos[i,4]:=sigmaf
  datos[i,5]:=iner
EndFor
Disp "Conectividad(xi,xf)"
Disp ["ni",subMat(datosn,1,1,b,2)]'
Disp ["nf"]
Disp "Datos (Area,E,Iner)"
Disp ["Area",subMat(datos,1,1,b,2)]'
Disp ["E"]
Disp ["Inercia",subMat(datos,1,5,b,5)]'
©-----
©Creacion Matriz Kb y Mrk
©-----
For i,1,b
  nii:=datosn[i,1]
  nff:=datosn[i,2]

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$$le := \sqrt{(nodos[nff,1] - nodos[nii,1])^2 + (nodos[nff,2] - nodos[nii,2])^2}$$

$$c := \frac{nodos[nff,1] - nodos[nii,1]}{le}$$

$$s := \frac{nodos[nff,2] - nodos[nii,2]}{le}$$

$\begin{bmatrix} c & -s & 0 & 0 & 0 & 0 \\ s & c & 0 & 0 & 0 & 0 \\ 0 & 0 & 1 & 0 & 0 & 0 \\ 0 & 0 & 0 & c & -s & 0 \\ 0 & 0 & 0 & s & c & 0 \\ 0 & 0 & 0 & 0 & 0 & 1 \end{bmatrix}$	$\frac{datos[i,2] \cdot datos[i,1]}{le}$	0	0	$\frac{-datos[i,2] \cdot datos[i,1]}{le}$
	0	$\frac{12 \cdot datos[i,2] \cdot datos[i,5]}{le^3}$	$\frac{6 \cdot datos[i,2] \cdot datos[i,5]}{le^2}$	0
	0	$\frac{6 \cdot datos[i,2] \cdot datos[i,5]}{le^2}$	$\frac{4 \cdot datos[i,2] \cdot datos[i,5]}{le^1}$	0
	$\frac{-datos[i,2] \cdot datos[i,1]}{le}$	0	0	$\frac{datos[i,2] \cdot datos[i,1]}{le}$
	0	$\frac{-12 \cdot datos[i,2] \cdot datos[i,5]}{le^3}$	$\frac{-6 \cdot datos[i,2] \cdot datos[i,5]}{le^2}$	0
	0	$\frac{6 \cdot datos[i,2] \cdot datos[i,5]}{le^2}$	$\frac{2 \cdot datos[i,2] \cdot datos[i,5]}{le^1}$	0

Disp "MR Elemento",i

Disp kb

gdl[1]:=3·nii-2

gdl[2]:=3·nii-1

gdl[3]:=3·nii

gdl[4]:=3·nff-2

gdl[5]:=3·nff-1

gdl[6]:=3·nff

For hh,1,6

For j,1,6

gdl1:=gdl[hh]

gdl2:=gdl[j]

mrk[gdl1,gdl2]:=kb[hh,j]+mrk[gdl1,gdl2]

EndFor

EndFor

EndFor

Disp "MR Ensamble"

Disp mrk

©-----

©Cond.Despla.Q

©-----

For i,1,desp

Request "Q GDL",mdesp1[i,1],0

Request "Valor Q",mdesp2[i,1],0

EndFor

Disp "Q conocidos"

Disp "Q GDL",mdesp1'

Disp "Valor GDL",mdesp2'

©-----

©Cond.Despla.F

©-----

For i,1,load

Request "F GDL",mload1[i,1],0

Request "Valor F",mload2[i,1],0

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EndFor
Disp "F conocidos"
Disp "F GDL",mload1'
Disp "Valor F",mload2'
©-----
©Kaa (Q conocidos)
©-----
i:=1
j:=1
ii:=1
jj:=1
While j≤nn
  cont:=0
  For h,1,desp
    If mdesp1[h,1]=i or mdesp1[h,1]=j Then
      cont:=cont+1
      If i=j Then
        cont:=cont+1
      EndIf
    EndIf
  EndFor
  If cont=0 Then
    kprim[ii,jj]:=mrk[i,j]
    jj:=jj+1
    If jj>nn-desp Then
      ii:=ii+1
      jj:=1
    EndIf
  EndIf
  j:=j+1
  If j=nn+1 Then
    j:=1
    i:=i+1
  EndIf
  If i=nn+1 Then
    j:=nn+1
  EndIf
EndWhile
Disp "KAA (Q con)"
Disp kprim
©-----
©Kab (Q desconocidos)
©-----
i:=1
j:=1
ii:=1
jj:=1
While j≤nn
  cont:=0
  For h,1,desp
    If mdesp1[h,1]=i or mdesp1[h,1]=j Then
      cont:=cont+1
      If i=j Then
        cont:=cont+1
      EndIf
    EndIf
  EndFor

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EndFor
cont2:=0
For h,1,desp
  If mdesp1[h,1]=i Then
    cont2:=cont2+1
  EndIf
EndFor
If cont=1 and cont2=0 Then
  kab[ii,jj]:=mrk[i,j]
  jj:=jj+1
  If jj>desp Then
    ii:=ii+1
    jj:=1
  EndIf
EndIf
j:=j+1
If j=nn+1 Then
  j:=1
  i:=i+1
EndIf
If i=nn+1 Then
  j:=nn+1
EndIf
EndWhile
Disp "KAB (Q desco)"
Disp kab
©-----
©Matrix Fext
©-----
For i,1,nn
  ff[i,1]:=0
EndFor
For i,1,load
  ff[mload1[i,1],1]:=mload2[i,1]
EndFor
©-----
©M Fext conocidas
©-----
For i,1,nn-desp
  fa[i,1]:=0
EndFor
ii:=1
For i,1,nn
  cont2:=0
  For h,1,desp
    If mdesp1[h,1]=i Then
      cont2:=cont2+1
    EndIf
  EndFor
  If cont2=0 Then
    fa[ii,1]:=ff[i,1]
    ii:=ii+1
  EndIf
EndFor
©-----
©Solucionar Q desconocidos

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©-----
ffprimagauss1:=kab* mdesp2
For i,1,nn-desp
ffprimagauss1[i,1]:=fa[i,1]-ffprimagauss1[i,1]
EndFor
For i,1,nn-desp
If kprim[i,i]=0 Then
kprim[i,i]:=1.E-7
EndIf
EndFor

qqprima:=kprim-1.ffprimagauss1
Disp "Q desconocidos"
Disp qqprima
©-----
©Crear M.Q.desp
©-----
For i,1,nn
qq[i,1]:=0
EndFor
For i,1,desp
qq[mdesp1[i,1],1]:=mdesp2[i,1]
EndFor
ii:=1
For i,1,nn
cont:=0
For h,1,desp
If mdesp1[h,1]=i Then
cont:=cont+1
EndIf
EndFor
If cont=0 Then
qq[i,1]:=qqprima[ii,1]
ii:=ii+1
EndIf
EndFor
Disp "Q solution "
Disp qqT
©-----
©Solucion Fext FF
©-----
mrk qq →ff
Disp "Fext nodos"
Disp ffT
EndPrgm

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