(adaptado de Grainger e Stevenson)
Tópico: Exemplificação de cálculos do efeito de contingências usando a matriz Z

Rede

Todos os valores em p.u

Linhas (z)		**Produção**	
1-2	j0.1	nó 1	CR
1-4	j0.05	nó 5	1.45
2-3	j0.0625	$V_1=V_5=1$ pu	
2-5	j0.04	**Carga**	
3-5	j0.05	2	1.4+j0.10
4-5	j0.08	3	1.0+j0.20
2	j5	4	0.8+j0.15

Tensões /caso base (obtidas executando um TP)

```
»   V=[1   0.986301-0.083834j   0.984789-0.095108j   0.993653-0.045583j   0.998498-
0.054795j].'

V =

   1.0000
   0.9863 - 0.0838i
   0.9848 - 0.0951i
   0.9937 - 0.0456i
   0.9985 - 0.0548i
```

Matrizes Y e Z

```
» Y=[1/0.1j+1/0.05j -1/0.1j 0 -1/0.05j 0;
-1/0.1j 1/0.1j+1/0.04j+1/0.0625j+1/5j -1/0.0625j 0 -1/0.04j;
0 -1/0.0625j 1/0.0625j+1/0.05j 0 -1/0.05j;
-1/0.05j 0 0 1/0.05j+1/0.08j -1/0.08j;
0 -1/0.04j -1/0.05j -1/0.08j 1/0.04j+1/0.05j+1/0.08j]


Y =

  Columns 1 through 4

        0 -30.0000i        0 +10.0000i        0                  0 +20.0000i
        0 +10.0000i        0 -51.2000i        0 +16.0000i        0
        0                  0 +16.0000i        0 -36.0000i        0
        0 +20.0000i        0                  0                  0 -32.5000i
        0                  0 +25.0000i        0 +20.0000i        0 +12.5000i

  Column 5

        0
        0 +25.0000i
        0 +20.0000i
        0 +12.5000i
        0 -57.5000i
```

```
» Z=inv(Y)

Z =

  Columns 1 through 4

        0 + 5.0615i        0 + 5.0000i        0 + 5.0063i        0 + 5.0422i
        0 + 5.0000i        0 + 5.0000i        0 + 5.0000i        0 + 5.0000i
        0 + 5.0063i        0 + 5.0000i        0 + 5.0358i        0 + 5.0095i
        0 + 5.0422i        0 + 5.0000i        0 + 5.0095i        0 + 5.0633i
        0 + 5.0114i        0 + 5.0000i        0 + 5.0145i        0 + 5.0171i

  Column 5

        0 + 5.0114i
        0 + 5.0000i
        0 + 5.0145i
        0 + 5.0171i
        0 + 5.0262i
```

Saída da linha 2-5: efeito na linha 5-3

```
» L5352=-(0.04j/0.05j)*(Z(5,5)-Z(5,2)-Z(3,5)+Z(3,2))/(Z(2,2)+Z(5,5)-2*Z(2,5)-0.04j)

L5352 =

    0.6715

» I53a=(V(5)-V(3))/0.05j

I53a =

   0.8063 - 0.2742i

» I52a=(V(5)-V(2))/0.04j

I52a =

   0.7260 - 0.3049i

» I53b=I53a+ L5352*I52a

I53b =

   1.2938 - 0.4789i

» abs(I53b),angle(I53b)*180/pi

ans =

    1.3796    (correcto: 1.381)

ans =

  -20.3142    (correcto: -18.51°)
```

Saída da linha 2-5: efeito nas tensões

```
» Ac=[0 1 0 0 -1]

Ac =

     0     1     0     0    -1

» Ia=Ac*V/(0.04j-Ac*Z*Ac')

Ia =

   - 2.0971 + 0.8808i

» Ia=(V(2)-V(5))/(0.04j-Z(5,5)+Z(2,2)-2*Z(2,5))

Ia =

   - 2.0971 + 0.8808i

» V1=V+Ia*Z*Ac'

V1 =

   1.0100 + 0.0238i        (1 + j0)            Notar que é CR
   0.9863 - 0.0838i        (0.9689 - j0.1081)
   0.9976 - 0.0646i        (0.9778 - j0.0885)
   1.0087 - 0.0098i        (0.9944 - j0.0334)
   1.0215 + 0.0001i        (0.9997 - j0.0231)  Notar que é PV

» I53c=(V1(5)-V1(3))/0.05j

I53c =

   1.2938 - 0.4789i        Igual ao obtido anteriormente, claro!
```

Transferência de 0.45 pu do barramento 5 para 1: efeito na linha 4-5

```
» K541=(Z(5,1)-Z(4,1))/0.08j, K545=(Z(5,5)-Z(4,5))/0.08j

K541 =

   -0.3853    (a corrente no sentido 5-4 diminui quando aumenta a corrente no nó 1)


K545 =

    0.1137    (a corrente no sentido 5-4 aumenta quando aumenta a corrente no nó 5)

» I54a=(V(5)-V(4))/0.08j

I54a =

  -0.1152 - 0.0606i

» I54b=I54a+ K541*0.45+K545*(-0.45)

I54b =

  -0.3397 - 0.0606i        (exacto: -0.3424 - j0.0483)
```