EJEMPLOS UTILIZACION MODULOS ANTERIORES

01 - EJEMPLO TEST

01 - 00a- REPRESENTACION DE LA SKYMATRIZ ORIGINALMEDIANTE EL VECTOR S

In[20]:=
```
p = {0, 1, 2, 5, 8, 9, 15};
```

In[21]:=
```
s = {11, 22, 13, 0, 33, 24, 34, 44, 55, 16, 0, 0, 46, 56, 66};
```

In[22]:=
```
S = {p, s};
```

01 - 00b- VECTOR DE FUERZAS NODALES CONSISTENTES

In[23]:=
```
f = {11, 22, 13, 0, 33, 24};
```

In[24]:=
```
f // MatrixForm
```

Out[24]//MatrixForm=

$$\begin{pmatrix} 11 \\ 22 \\ 13 \\ 0 \\ 33 \\ 24 \end{pmatrix}$$

01 - 00c- MATRIZ DE VECTORES DE FUERZAS NODALES CONSISTENTES - UN VECTOR PARA CADA CASO DE CARGA

In[25]:=
```
f1 = {11, 22, 13, 0, 33, 24};
f2 = {24, 33, 0, 13, 22, 11};
```

In[27]:=
```
B = Transpose[{f1, f2}];
```

In[28]:=
```
B // MatrixForm
```

Out[28]//MatrixForm=

$$\begin{pmatrix} 11 & 24 \\ 22 & 33 \\ 13 & 0 \\ 0 & 13 \\ 33 & 22 \\ 24 & 11 \end{pmatrix}$$

05 - 01a- RECONSTRUCCION DE LA SKYMATRIZ ORIGINAL A PARTIR DEL VECTOR S

In[29]:=
```
Ko = SymmSkyMatrixConvertToFull[S];
```

In[30]:=
```
Ko // MatrixForm
```

Out[30]//MatrixForm=

$$\begin{pmatrix} 11 & 0 & 13 & 0 & 0 & 16 \\ 0 & 22 & 0 & 24 & 0 & 0 \\ 13 & 0 & 33 & 34 & 0 & 0 \\ 0 & 24 & 34 & 44 & 0 & 46 \\ 0 & 0 & 0 & 0 & 55 & 56 \\ 16 & 0 & 0 & 46 & 56 & 66 \end{pmatrix}$$

In[31]:=
```
SymmSkyMatrixLowerTriangleMap[S]
```

```
  123456

1+
2 +
3+0+
4 +++
5    +
6+00+++
```

In[32]:=
```
SymmSkyMatrixUpperTriangleMap[S]
```

```
  123456

1+ +   +
2 +0+  0
3  ++  0
4   +  +
5    ++
6     +
```

In[33]:=
```
SymmSkyMatrixLowerTrianglePrint[S]
```

```
          Col   1   Col   2   Col   3   Col   4   Col   5
Row   1         11
Row   2                   22
Row   3         13          0         33
Row   4                   24         34         44
Row   5                                                55
Row   6         16          0          0         46         56


          Col   6
Row   6         66
```

In[34]:=
```
SymmSkyMatrixUpperTrianglePrint[S]
```

```
          Col   1   Col   2   Col   3   Col   4   Col   5
Row   1         11                    13
Row   2                   22          0         24
Row   3                               33         34
Row   4                                          44
Row   5                                                55


          Col   6
Row   1         16
Row   2          0
Row   3          0
Row   4         46
Row   5         56
Row   6         66
```

01 - 01b - METODO DIRECTO DE OBTENCION DE DESPLAZAMIENTOS SOLUCION - A COMPROBAR MEDIANTE EL PROCEDIMIENTO DE FACTORIZACION (1a FASE) Y SOLUCION (2a FASE)

In[35]:=
```
us = Inverse[Ko].f
```

Out[35]=
$$\left\{\frac{52\,530\,253}{37\,770\,343}, \frac{61\,300\,591}{37\,770\,343}, \frac{16\,408\,502}{37\,770\,343}, -\frac{21\,569\,394}{37\,770\,343}, \frac{46\,568\,449}{37\,770\,343}, -\frac{23\,479\,346}{37\,770\,343}\right\}$$

In[36]:=
```
% // MatrixForm
```

Out[36]//MatrixForm=

$$\begin{pmatrix} \frac{52530253}{37770343} \\ \frac{61300591}{37770343} \\ \frac{16408502}{37770343} \\ -\frac{21569394}{37770343} \\ \frac{46568449}{37770343} \\ -\frac{23479346}{37770343} \end{pmatrix}$$

05 - 02a- 1a FASE - FACTORIZACION DE LA SKYMATRIZ ORIGINAL A PARTIR DEL VECTOR S

In[37]:=
```
{F, fail} = SymmSkyMatrixFactor[S, 10.^(-12)]
```

Out[37]=

$$\left\{\left\{\{0, 1, 2, 5, 8, 9, 15\},\ \left\{\frac{1}{11}, \frac{1}{22}, \frac{13}{11}, 0, \frac{11}{194}, \frac{12}{11}, \frac{187}{97}, -\frac{1067}{50926}, \frac{1}{55}, \frac{16}{11}, 0, -\frac{104}{97}, -\frac{43989}{25463}, \frac{56}{55}, \frac{1400465}{151081372}\right\}\right\}, 0\right\}$$

In[38]:=
```
Sf = F
```

Out[38]=

$$\left\{\{0, 1, 2, 5, 8, 9, 15\},\ \left\{\frac{1}{11}, \frac{1}{22}, \frac{13}{11}, 0, \frac{11}{194}, \frac{12}{11}, \frac{187}{97}, -\frac{1067}{50926}, \frac{1}{55}, \frac{16}{11}, 0, -\frac{104}{97}, -\frac{43989}{25463}, \frac{56}{55}, \frac{1400465}{151081372}\right\}\right\}$$

In[39]:=
```
SymmSkyMatrixConvertToFull[Sf];
```

In[40]:=
```
% // MatrixForm
```

Out[40]//MatrixForm=

$$\begin{pmatrix} \frac{1}{11} & 0 & \frac{13}{11} & 0 & 0 & \frac{16}{11} \\ 0 & \frac{1}{22} & 0 & \frac{12}{11} & 0 & 0 \\ \frac{13}{11} & 0 & \frac{11}{194} & \frac{187}{97} & 0 & -\frac{104}{97} \\ 0 & \frac{12}{11} & \frac{187}{97} & -\frac{1067}{50926} & 0 & -\frac{43989}{25463} \\ 0 & 0 & 0 & 0 & \frac{1}{55} & \frac{56}{55} \\ \frac{16}{11} & 0 & -\frac{104}{97} & -\frac{43989}{25463} & \frac{56}{55} & \frac{1400465}{151081372} \end{pmatrix}$$

DESPLAZAMIENTOS SOLUCION - OBTENIDOS DIRECTAMENTE A PARTIR DE LA FACTORIZACION DE LA SKYMATRIZ ORIGINAL

In[41]:=
```
uf = SymmSkyMatrixVectorSolve[Sf, f] // MatrixForm
```

Out[41]//MatrixForm=

$$\begin{pmatrix} \frac{52530253}{37770343} \\ \frac{61300591}{37770343} \\ \frac{16408502}{37770343} \\ -\frac{21569394}{37770343} \\ \frac{46568449}{37770343} \\ -\frac{23479346}{37770343} \end{pmatrix}$$

DESPLAZAMIENTOS SOLUCION - OBTENIDOS DIRECTAMENTE A PARTIR DE LA FACTORIZACION DE LA SKYMATRIZ ORIGINAL - MATRIZ DE CASOS DE CARGA

In[42]:=
```
ufm = SymmSkyMatrixColBlockSolve[Sf, B];
```

In[43]:=
```
% // MatrixForm
```

Out[43]//MatrixForm=

$$\begin{pmatrix} \frac{52530253}{37770343} & \frac{87727409}{37770343} \\ \frac{61300591}{37770343} & \frac{197029773}{75540686} \\ \frac{16408502}{37770343} & \frac{4974569}{37770343} \\ -\frac{21569394}{37770343} & -\frac{38371091}{37770343} \\ \frac{46568449}{37770343} & \frac{22947034}{37770343} \\ -\frac{23479346}{37770343} & -\frac{15397833}{75540686} \end{pmatrix}$$

In[44]:=
```
(*SymmSkyMatrixRowLengths[S]*)
```

05 - 02b- MATRICES QUE CONSTITUYEN LA FACTORIZACION DE LA SKYMATRIZ ORIGINAL

D INVERSA - D1

In[45]:=
```
D1 = {{1/11, 0, 0, 0, 0, 0}, {0, 1/22, 0, 0, 0, 0}, {0, 0, 11/194, 0, 0, 0}, {0, 0, 0, -1067/50926, 0, 0}, {0, 0, 0, 0, 1/55, 0}, {0, 0, 0, 0, 0, 1400465/151081372}};
```

In[46]:=
```
SymmSkyMatrixConvertDiagonalToFull[Sf];
```

In[47]:=
```
% // MatrixForm
```

Out[47]//MatrixForm=

$$\begin{pmatrix} \frac{1}{11} & 0 & 0 & 0 & 0 & 0 \\ 0 & \frac{1}{22} & 0 & 0 & 0 & 0 \\ 0 & 0 & \frac{11}{194} & 0 & 0 & 0 \\ 0 & 0 & 0 & -\frac{1067}{50926} & 0 & 0 \\ 0 & 0 & 0 & 0 & \frac{1}{55} & 0 \\ 0 & 0 & 0 & 0 & 0 & \frac{1400465}{151081372} \end{pmatrix}$$

U

In[48]:=
```
U = {{1, 0, 13/11, 0, 0, 16/11}, {0, 1, 0, 12/11, 0, 0}, {0, 0, 1, 187/97, 0, -104/97}, {0, 0, 0, 1, 0, -43989/25463}, {0, 0, 0, 0, 1, 56/55}, {0, 0, 0, 0, 0, 1}};
```

In[49]:=
```
SymmSkyMatrixConvertUnitUpperTriangleToFull[Sf];
```

In[50]:=
```
% // MatrixForm
```

Out[50]//MatrixForm=

$$\begin{pmatrix} 1 & 0 & \frac{13}{11} & 0 & 0 & \frac{16}{11} \\ 0 & 1 & 0 & \frac{12}{11} & 0 & 0 \\ 0 & 0 & 1 & \frac{187}{97} & 0 & -\frac{104}{97} \\ 0 & 0 & 0 & 1 & 0 & -\frac{43989}{25463} \\ 0 & 0 & 0 & 0 & 1 & \frac{56}{55} \\ 0 & 0 & 0 & 0 & 0 & 1 \end{pmatrix}$$

In[51]:=
```
L = Transpose[U];
```

In[52]:=
```
% // MatrixForm
```

Out[52]//MatrixForm=

$$\begin{pmatrix} 1 & 0 & 0 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 & 0 & 0 \\ \frac{13}{11} & 0 & 1 & 0 & 0 & 0 \\ 0 & \frac{12}{11} & \frac{187}{97} & 1 & 0 & 0 \\ 0 & 0 & 0 & 0 & 1 & 0 \\ \frac{16}{11} & 0 & -\frac{104}{97} & -\frac{43989}{25463} & \frac{56}{55} & 1 \end{pmatrix}$$

In[53]:=
```
Df = Inverse[D1];
```

In[54]:=
```
% // MatrixForm
```

Out[54]//MatrixForm=

$$\begin{pmatrix} 11 & 0 & 0 & 0 & 0 & 0 \\ 0 & 22 & 0 & 0 & 0 & 0 \\ 0 & 0 & \frac{194}{11} & 0 & 0 & 0 \\ 0 & 0 & 0 & -\frac{50926}{1067} & 0 & 0 \\ 0 & 0 & 0 & 0 & 55 & 0 \\ 0 & 0 & 0 & 0 & 0 & \frac{151081372}{1400465} \end{pmatrix}$$

05 - 02c- COMPROBACION DE LA FACTORIZACION DE LA SKYMATRIZ ORIGINAL

In[55]:=
```
Kc = L.Df.U;
```

In[56]:=
```
% // MatrixForm
```

Out[56]//MatrixForm=

$$\begin{pmatrix} 11 & 0 & 13 & 0 & 0 & 16 \\ 0 & 22 & 0 & 24 & 0 & 0 \\ 13 & 0 & 33 & 34 & 0 & 0 \\ 0 & 24 & 34 & 44 & 0 & 46 \\ 0 & 0 & 0 & 0 & 55 & 56 \\ 16 & 0 & 0 & 46 & 56 & 66 \end{pmatrix}$$

In[57]:=
```
So = SymmSkyMatrixLDinvUReconstruct[Sf]
```

Out[57]=
```
{{0, 1, 2, 5, 8, 9, 15}, {11, 22, 13, 0, 33, 24, 34, 44, 55, 16, 0, 0, 46, 56, 66}}
```

In[58]:=
```
SymmSkyMatrixConvertToFull[So];
```

In[59]:=
```
% // MatrixForm
```

Out[59]//MatrixForm=

$$\begin{pmatrix} 11 & 0 & 13 & 0 & 0 & 16 \\ 0 & 22 & 0 & 24 & 0 & 0 \\ 13 & 0 & 33 & 34 & 0 & 0 \\ 0 & 24 & 34 & 44 & 0 & 46 \\ 0 & 0 & 0 & 0 & 55 & 56 \\ 16 & 0 & 0 & 46 & 56 & 66 \end{pmatrix}$$

05 - 03c- 2a FASE - *1a PARTE* - SOLUCION INTERMEDIA

In[60]:=
```
Xi = Inverse[L].f
```

Out[60]=

$$\left\{11, 22, 0, -24, 33, -\frac{8\,537\,944}{127\,315}\right\}$$

05 - 03c- 2a FASE - *2a PARTE* - SOLUCION FINAL

In[61]:=
```
uf = Inverse[Df.U].Xi
```

Out[61]=

$$\left\{\frac{52\,530\,253}{37\,770\,343}, \frac{61\,300\,591}{37\,770\,343}, \frac{16\,408\,502}{37\,770\,343}, -\frac{21\,569\,394}{37\,770\,343}, \frac{46\,568\,449}{37\,770\,343}, -\frac{23\,479\,346}{37\,770\,343}\right\}$$

In[62]:=
```
us
```

Out[62]=

$$\left\{\frac{52\,530\,253}{37\,770\,343}, \frac{61\,300\,591}{37\,770\,343}, \frac{16\,408\,502}{37\,770\,343}, -\frac{21\,569\,394}{37\,770\,343}, \frac{46\,568\,449}{37\,770\,343}, -\frac{23\,479\,346}{37\,770\,343}\right\}$$

In[63]:=
```
SymmSkyMatrixVectorMultiply[S, uf]
```

Out[63]=

{11, 22, 13, 0, 33, 24}

In[64]:=
```
f1
```

Out[64]=

{11, 22, 13, 0, 33, 24}