In[1]:=
```
SetDirectory["/www/user/fdahl/papers/Conjugation/"];
<< kappaLib.m
<< Petrov.m
```

```
KappaLib v1.1

Petrov routine loaded
```

- **Class XXII: (31 1bar(1))**

In[4]:=
$$B = \begin{pmatrix} 0 & 0 & 0 & 1 & 0 & 0 \\ 0 & 0 & 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 0 & 0 & 1 \\ 1 & 0 & 0 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 & 0 & 0 \\ 0 & 0 & 1 & 0 & 0 & 0 \end{pmatrix};$$

In[5]:=
$$V = \begin{pmatrix} \text{lam1} & 1 & 0 & 0 & 0 & 0 \\ 0 & \text{lam1} & 1 & 0 & 0 & 0 \\ 0 & 0 & \text{lam1} & 0 & 0 & 0 \\ 0 & 0 & 0 & \text{lam2} & 0 & 0 \\ 0 & 0 & 0 & 0 & \text{sigma1} & \text{tau1} \\ 0 & 0 & 0 & 0 & -\text{tau1} & \text{sigma1} \end{pmatrix};$$

In[6]:=
```
Eigenvalues[V]
```

Out[6]=
```
{lam1, lam1, lam1, lam2, sigma1 - i tau1, sigma1 + i tau1}
```

In[7]:=
$$W = \begin{pmatrix} 0 & 0 & \text{eps1} & 0 & 0 & 0 \\ 0 & \text{eps1} & 0 & 0 & 0 & 0 \\ \text{eps1} & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & \text{eps2} & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 1 \\ 0 & 0 & 0 & 0 & 1 & 0 \end{pmatrix};$$

- **Possible choices for eps_i:**

In[8]:=
```
Eigenvalues[W]
```

Out[8]=
```
{-1, 1, -eps1, eps1, eps1, eps2}
```

In[9]:=
```
s[i_] := (-1)^i
```

In[10]:=
```
For[i1 = 0, i1 ≤ 1, i1++,
 For[i2 = 0, i2 ≤ 1, i2++,
  Print[ToString[{s[i1], s[i2]}]];
  Print[Sort[Eigenvalues[W] /. {eps1 → s[i1], eps2 → s[i2]}]];
 ]
]
```

{1, 1}

{-1, -1, 1, 1, 1, 1}

{1, -1}

{-1, -1, -1, 1, 1, 1}

{-1, 1}

{-1, -1, -1, 1, 1, 1}

{-1, -1}

{-1, -1, -1, -1, 1, 1}

## ■ 4 sign possibilities: (e1,e2)= {+-, -+}

In[11]:=
```
W = W /. {eps2 → -eps1};
Eigenvalues[W]
```

Out[12]= {-1, 1, -eps1, -eps1, eps1, eps1}

In[13]:=
```
(* See ClassXXII_Solve.nb *)
S = {{0, 0, 0, 0, 0, 1}, {1, 0, 0, 0, 0, 0}, {0, 1/Sqrt[2], 0, 1/Sqrt[2], 0, 0}, {0, 0, 0, 0, 1, 0}, {0, 0, eps1, 0, 0, 0}, {0, eps1/Sqrt[2], 0, -eps1/Sqrt[2], 0, 0}};
```

## ■ Check that S is in the set mathcal(S)

In[14]:=
```
Transpose[S].B.S == W
```

Out[14]= True

## ■ Compute result

In[15]:=
```
res = S.V.Inverse[S];
r = Simplify[res];
r // MatrixForm
```

Out[17]//MatrixForm=

$$\begin{pmatrix} \text{sigma1} & 0 & 0 & -\text{tau1} & 0 & 0 \\ 0 & \text{lam1} & \frac{1}{\sqrt{2}} & 0 & 0 & \frac{1}{\sqrt{2}\ \text{eps1}} \\ 0 & 0 & \frac{\text{lam1}+\text{lam2}}{2} & 0 & \frac{1}{\sqrt{2}\ \text{eps1}} & \frac{\text{lam1}-\text{lam2}}{2\,\text{eps1}} \\ \text{tau1} & 0 & 0 & \text{sigma1} & 0 & 0 \\ 0 & 0 & 0 & 0 & \text{lam1} & 0 \\ 0 & 0 & \frac{1}{2}\,\text{eps1}\,(\text{lam1}-\text{lam2}) & 0 & \frac{1}{\sqrt{2}} & \frac{\text{lam1}+\text{lam2}}{2} \end{pmatrix}$$

In[18]:=
```
Petrov[r]
```

Out[18]//MatrixForm=

$$\begin{pmatrix} -\text{tau1} & 0 & 0 & 0 & 0 & \text{sigma1} \\ 0 & 0 & \frac{1}{\sqrt{2}\ \text{eps1}} & \frac{1}{\sqrt{2}} & \text{lam1} & 0 \\ 0 & \frac{1}{\sqrt{2}\ \text{eps1}} & \frac{\text{lam1}-\text{lam2}}{2\,\text{eps1}} & \frac{\text{lam1}+\text{lam2}}{2} & 0 & 0 \\ 0 & \frac{1}{\sqrt{2}} & \frac{\text{lam1}+\text{lam2}}{2} & \frac{1}{2}\,\text{eps1}\,(\text{lam1}-\text{lam2}) & 0 & 0 \\ 0 & \text{lam1} & 0 & 0 & 0 & 0 \\ \text{sigma1} & 0 & 0 & 0 & 0 & \text{tau1} \end{pmatrix}$$

## ■ Export notebook as .pdf

In[19]:=
```
NotebookPrint[SelectedNotebook[],
 "/www/user/fdahl/papers/Conjugation/notebooks/ClassXXII.pdf"]
```