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

```
KappaLib v1.1

Petrov routine loaded
```

- **Class XIX: (51)**

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]:= $V = \begin{pmatrix} lam1 & 1 & 0 & 0 & 0 & 0 \\ 0 & lam1 & 1 & 0 & 0 & 0 \\ 0 & 0 & lam1 & 1 & 0 & 0 \\ 0 & 0 & 0 & lam1 & 1 & 0 \\ 0 & 0 & 0 & 0 & lam1 & 0 \\ 0 & 0 & 0 & 0 & 0 & lam2 \end{pmatrix};$

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

Out[6]= {lam1, lam1, lam1, lam1, lam1, lam2}
```

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

- **Here we may not assume that eps1 <= eps2.**

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

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

In[9]:= Sort[Eigenvalues[W] /. {eps1 → -1, eps2 → -1}]
        Sort[Eigenvalues[W] /. {eps1 → -1, eps2 → 1}]
        Sort[Eigenvalues[W] /. {eps1 → 1, eps2 → -1}]
        Sort[Eigenvalues[W] /. {eps1 → 1, eps2 → 1}]

Out[9]= {-1, -1, -1, -1, 1, 1}

Out[10]= {-1, -1, -1, 1, 1, 1}

Out[11]= {-1, -1, -1, 1, 1, 1}

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

We may assume that eps2 = -eps1

In[13]:=
```
W = W /. {eps2 → -eps1};
Eigenvalues[W]
```

Out[14]= {-eps1, -eps1, -eps1, eps1, eps1, eps1}

In[15]:= (* Found using FinsSPermutations.m *)

$$S = \begin{pmatrix} 0 & 0 & 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 1 & 0 & 0 \\ 0 & 0 & \frac{1}{\sqrt{2}} & 0 & 0 & \frac{1}{\sqrt{2}} \\ eps1 & 0 & 0 & 0 & 0 & 0 \\ 0 & eps1 & 0 & 0 & 0 & 0 \\ 0 & 0 & \frac{eps1}{\sqrt{2}} & 0 & 0 & -\frac{eps1}{\sqrt{2}} \end{pmatrix};$$

Check that S is in the set mathcal(S)

In[16]:=
```
Transpose[S].B.S == W
```

Out[16]= True

Compute result

In[17]:=
```
res = S.V.Inverse[S];
r = Simplify[res];
r // MatrixForm
```

Out[19]//MatrixForm=

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

In[20]:=
```
Petrov[r]
```

Out[20]//MatrixForm=

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

Export notebook as .pdf

In[21]:=
```
NotebookPrint[SelectedNotebook[],
 "/www/user/fdahl/papers/Conjugation/notebooks/ClassXIX.pdf"]
```