

```

 $\theta[K\_]$  := Module[ {Cs,  $\varphi$ , n, A, s, i, j, k,  $\Delta$ , G, v,  $\alpha$ ,  $\beta$ , gEval, c, z},
  {Cs,  $\varphi$ } = Rot[K]; n = Length[Cs];
  A = IdentityMatrix[2 n + 1];
  Cases[Cs, {s_, i_, j_} :=
    (A[[{i, j}, {i + 1, j + 1}]] += (  $\begin{pmatrix} -T^s & T^s & -1 \\ \mathbf{0} & & -1 \end{pmatrix}$  ) );
   $\Delta$  = T(-Total[ $\varphi$ ] - Total[Cs[[All, 1]])/2 Det[A];
  G = Inverse[A];
  gEval[ $\mathcal{E}$ _] := Factor[ $\mathcal{E}$  /. gv_,  $\alpha$ _,  $\beta$ _] := (G[[ $\alpha$ ,  $\beta$ ]] /. T → Tv)];
  z = gEval[ $\sum_{k_1=1}^n \sum_{k_2=1}^n \theta[Cs[[k_1]], Cs[[k_2]]]$ ];
  z += gEval[ $\sum_{k=1}^n R_1 @@ Cs[[k]]$ ];
  z += gEval[ $\sum_{k=1}^{2^n} R_1[\varphi[[k]], k]$ ];
  { $\Delta$ , ( $\Delta$  /. T → T1) ( $\Delta$  /. T → T2) ( $\Delta$  /. T → T3) z} // Factor];

```