```mathematica
Θ[K_] := Module[{Cs, φ, n, A, Δ, G, ev, Θ},
   {Cs, φ} = Rot[K]; n = Length[Cs];
   A = IdentityMatrix[2 n + 1];
   Cases[Cs, {s_, i_, j_} :> (A[[{i, j}, {i + 1, j + 1}]] += (-T^s  T^s - 1
                                                              0    -1   ))];
   Δ = T^(-Total[φ] - Total[Cs[[All, 1]]])/2 Det[A];
   G = Inverse[A];
   ev[ℰ_] := Factor[ℰ /. g_{ν_, α_, β_} :> (G[[α, β]] /. T -> T_ν)];
   Θ = ev[∑_{k1=1}^n ∑_{k2=1}^n R_12[Cs[[k1]], Cs[[k2]]]];
   Θ += ev[∑_{k=1}^n R_11[Cs[[k]]]];
   Θ += ev[∑_{k=1}^{2 n} Γ_1[φ[[k]], k]];
   Factor@{Δ, (Δ /. T -> T_1) (Δ /. T -> T_2) (Δ /. T -> T_3) Θ}];
```