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SBasis = SortBy[$Basis, If[#[[1]] == x, {0, #[[3]] - #[[2]]}, {1, #[[2]] - #[[3]]}] &];
sol[-1] = Table[If[SSQ[bb], ((bb /. x → ξ1) + (bb /. x → ξ2)), 0], {bb, $Basis}];
Do[
  Block[{ $k = k},
    s0 = Thread[$Basis → sol[k - 1]];
    lhs = λTangent[
      Join[Table[If[NilQ[bb], λ, 1] bb (bb /. {x → ξ1, y → η1}), {bb, $Basis}],
        Table[If[NilQ[bb], λ, 1] bb (bb /. {x → ξ2, y → η2}), {bb, $Basis}]]];
    rhs = λTangent[
      $Basis ($Basis /. {xαβ → (xαβ /. s0) + εk fαβ[λ], yαβ → (yαβ /. s0) + εk gαβ[λ]})];
    eqns = Transpose@{
      (Coefficient[CF[lhs - rhs], #] == 0) & /@ SBasis,
      SBasis /. {xαβ → fαβ[0] == 0, yαβ → gαβ[0] == 0}];
    unknowns = SBasis /. {xαβ → fαβ[λ], yαβ → gαβ[λ]};
    s = TriangularDSolve[eqns, unknowns, λ];
    sol[k] = CF[sol[k - 1] + εk ($Basis /. {xαβ → fαβ[λ], yαβ → gαβ[λ]} /. s)]
  ],
  {k, 0, $k}
];

cm[i_, j_ → k_] :=
  Δ2E{i,j}→{k}[sol[$k].$Basis /. {xαβ → xαβ[k], yαβ → yαβ[k], ξ1αβ → ξαβ[i], η1αβ → ηαβ[i],
    ξ2αβ → ξαβ[j], η2αβ → ηαβ[j], λ → 1}];
Short[cm[i, j → k], 10]

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