

restart;

with(LinearAlgebra);

[&x, Add, Adjoint, BackwardSubstitute, BandMatrix, Basis,

BezoutMatrix, BidiagonalForm, BilinearForm, CARE,

CharacteristicMatrix, CharacteristicPolynomial, Column,

ColumnDimension, ColumnOperation, ColumnSpace, CompanionMatrix,

CompressedSparseForm, ConditionNumber, ConstantMatrix,

ConstantVector, Copy, CreatePermutation, CrossProduct, DARE,

DeleteColumn, DeleteRow, Determinant, Diagonal, DiagonalMatrix,

Dimension, Dimensions, DotProduct, EigenConditionNumbers,

Eigenvalues, Eigenvectors, Equal, ForwardSubstitute,

FrobeniusForm, FromCompressedSparseForm, FromSplitForm,

GaussianElimination, GenerateEquations, GenerateMatrix,

Generic, GetResultDataType, GetResultShape,

GivensRotationMatrix, GramSchmidt, HankelMatrix, HermiteForm,

HermitianTranspose, HessenbergForm, HilbertMatrix,

HouseholderMatrix, IdentityMatrix, IntersectionBasis,

IsDefinite, IsOrthogonal, IsSimilar, IsUnitary,

JordanBlockMatrix, JordanForm, KroneckerProduct, LA_Main,

LUdecomposition, LeastSquares, LinearSolve, LyapunovSolve, Map,

Map2, MatrixAdd, MatrixExponential, MatrixFunction,

MatrixInverse, MatrixMatrixMultiply, MatrixNorm, MatrixPower,

MatrixScalarMultiply, MatrixVectorMultiply, MinimalPolynomial,

Minor, Modular, Multiply, NoUserValue, Norm, Normalize,

NullSpace, OuterProductMatrix, Permanent, Pivot, PopovForm,

ProjectionMatrix, QRdecomposition, RandomMatrix, RandomVector,

Rank, RationalCanonicalForm, ReducedRowEchelonForm, Row,
RowDimension, RowOperation, RowSpace, ScalarMatrix,
ScalarMultiply, ScalarVector, SchurForm, SingularValues,
SmithForm, SplitForm, StronglyConnectedBlocks, SubMatrix,
SubVector, SumBasis, SylvesterMatrix, SylvesterSolve,
ToeplitzMatrix, Trace, Transpose, TridiagonalForm, UnitVector,
VandermondeMatrix, VectorAdd, VectorAngle,
VectorMatrixMultiply, VectorNorm, VectorScalarMultiply,
ZeroMatrix, ZeroVector, Zip]

$$E1 := 3*P[1]*U[1]^2*mu[0]*q[1]^2 + 3*P[2]*V[1]^2*mu[0]*q[1]^2 + 2*Q[2]*q[1]^4;$$

$$E2 := 5*lambda*P[1]*U[1]^2*mu[0]*q[1]^2 + 5*lambda*P[2]*V[1]^2*mu[0]*q[1]^2 + 2*q__0*P[1]*U[1]^2*mu[0]*q[1] + 2*q__0*P[2]*V[1]^2*mu[0]*q[1] + 8*q__0*Q[2]*q[1]^3 - 2*P[1]*U[1]*U[2]*q[1]^2 - 2*P[2]*V[1]*V[2]*q[1]^2 - 2*omega[1]*q[1]^2;$$

$$E3 := 2*lambda^2*P[1]*U[1]^2*mu[0]*q[1]^2 + 2*lambda^2*P[2]*V[1]^2*mu[0]*q[1]^2 + 3*lambda*q__0*P[1]*U[1]^2*mu[0]*q[1] + 3*lambda*q__0*P[2]*V[1]^2*mu[0]*q[1] + 4*mu*P[1]*U[1]^2*mu[0]*q[1]^2 + 4*mu*P[2]*V[1]^2*mu[0]*q[1]^2 - 2*lambda*P[1]*U[1]*U[2]*q[1]^2 - 2*lambda*P[2]*V[1]*V[2]*q[1]^2 + 8*b__1*Q[2]*q[1]^3 + 12*q__0^2*Q[2]*q[1]^2 - 2*q__0*P[1]*U[1]*U[2]*q[1] - 2*q__0*P[2]*V[1]*V[2]*q[1] - 2*lambda*omega[1]*q[1]^2 - 2*q__0*omega[1]*q[1] + R[1]*q[1]^2;$$

$$E4 := lambda^2*q__0*P[1]*U[1]^2*mu[0]*q[1] + lambda^2*q__0*P[2]*V[1]^2*mu[0]*q[1] + 3*lambda*mu*P[1]*U[1]^2*mu[0]*q[1]^2 + 3*lambda*mu*P[2]*V[1]^2*mu[0]*q[1]^2 + 2*mu*q__0*P[1]*U[1]^2*mu[0]*q[1] + 2*mu*q__0*P[2]*V[1]^2*mu[0]*q[1] - 2*lambda*q__0*P[1]*U[1]*U[2]*q[1] - 2*lambda*q__0*P[2]*V[1]*V[2]*q[1] - 2*mu*P[1]*U[1]*U[2]*q[1]^2 - 2*mu*P[2]*V[1]*V[2]*q[1]^2 + 24*b__1*q__0*Q[2]*q[1]^2 + 8*q__0^3*Q[2]*q[1] - 2*lambda*q__0*omega[1]*q[1] - 2*mu*omega[1]*q[1]^2 + 2*q__0*R[1]*q[1];$$

$$\begin{aligned}
E5 := & \lambda \mu q_0 P[1] U[1]^2 \mu[0] q[1] + \lambda \mu q_0 P[2] V[1]^2 \mu[0] q[1] + \\
& \mu^2 P[1] U[1]^2 \mu[0] q[1]^2 + \mu^2 P[2] V[1]^2 \mu[0] q[1]^2 + \\
& b_{-1} \lambda \mu q_0 P[1] U[1]^2 \mu[0] + b_{-1} \lambda \mu q_0 P[2] V[1]^2 \mu[0] + \\
& b_{-1}^2 P[1] U[1]^2 \mu[0] + b_{-1}^2 P[2] V[1]^2 \mu[0] - 2 \mu q_0 P[1] U[1] U[2] q[1] - \\
& 2 \mu q_0 P[2] V[1] V[2] q[1] + 12 b_{-1}^2 Q[2] q[1]^2 + 24 b_{-1} q_0^2 Q[2] q[1] + \\
& 2 b_{-1} q_0 P[1] U[1] U[2] + 2 b_{-1} q_0 P[2] V[1] V[2] + 2 q_0^4 Q[2] - \\
& 2 \mu q_0 \omega[1] q[1] + 2 b_{-1} q_0 \omega[1] + 2 b_{-1} R[1] q[1] + q_0^2 R[1];
\end{aligned}$$

$$\begin{aligned}
E6 := & b_{-1} \lambda^2 q_0 P[1] U[1]^2 \mu[0] + b_{-1} \lambda^2 q_0 P[2] V[1]^2 \mu[0] + \\
& 3 b_{-1}^2 \lambda P[1] U[1]^2 \mu[0] + 3 b_{-1}^2 \lambda P[2] V[1]^2 \mu[0] + \\
& 2 b_{-1} \mu q_0 P[1] U[1]^2 \mu[0] + 2 b_{-1} \mu q_0 P[2] V[1]^2 \mu[0] + \\
& 2 b_{-1} \lambda \mu q_0 P[1] U[1] U[2] + 2 b_{-1} \lambda \mu q_0 P[2] V[1] V[2] + \\
& 24 b_{-1}^2 q_0 Q[2] q[1] + 2 b_{-1}^2 P[1] U[1] U[2] + 2 b_{-1}^2 P[2] V[1] V[2] + \\
& 8 b_{-1} q_0^3 Q[2] + 2 b_{-1} \lambda \mu q_0 \omega[1] + 2 b_{-1}^2 \omega[1] + \\
& 2 b_{-1} q_0 R[1];
\end{aligned}$$

$$\begin{aligned}
E7 := & 2 b_{-1}^2 \lambda^2 P[1] U[1]^2 \mu[0] + 2 b_{-1}^2 \lambda^2 P[2] V[1]^2 \mu[0] + \\
& 3 b_{-1} \lambda \mu q_0 P[1] U[1]^2 \mu[0] + 3 b_{-1} \lambda \mu q_0 P[2] V[1]^2 \mu[0] + \\
& 4 b_{-1}^2 \mu P[1] U[1]^2 \mu[0] + 4 b_{-1}^2 \mu P[2] V[1]^2 \mu[0] + \\
& 2 b_{-1}^2 \lambda P[1] U[1] U[2] + 2 b_{-1}^2 \lambda P[2] V[1] V[2] + \\
& 2 b_{-1} \mu q_0 P[1] U[1] U[2] + 2 b_{-1} \mu q_0 P[2] V[1] V[2] + 8 b_{-1}^3 Q[2] q[1] + \\
& 12 b_{-1}^2 q_0^2 Q[2] + 2 b_{-1}^2 \lambda \mu \omega[1] + 2 b_{-1} \mu q_0 \omega[1] + \\
& b_{-1}^2 R[1];
\end{aligned}$$

$$\begin{aligned}
E8 := & 5 b_{-1}^2 \lambda \mu P[1] U[1]^2 \mu[0] + 5 b_{-1}^2 \lambda \mu P[2] V[1]^2 \mu[0] + \\
& 2 b_{-1} \mu^2 q_0 P[1] U[1]^2 \mu[0] + 2 b_{-1} \mu^2 q_0 P[2] V[1]^2 \mu[0] + \\
& 2 b_{-1}^2 \mu P[1] U[1] U[2] + 2 b_{-1}^2 \mu P[2] V[1] V[2] + 8 b_{-1}^3 q_0 Q[2] + \\
& 2 b_{-1}^2 \mu \omega[1];
\end{aligned}$$

$$E9 := 3 b_{-1}^2 \mu^2 P[1] U[1]^2 \mu[0] + 3 b_{-1}^2 \mu^2 P[2] V[1]^2 \mu[0] + 2 b_{-1}^4 Q[2];$$

$$E10 := -P[1] U[1]^2 \mu[0]^2 q[1]^2 - P[2] V[1]^2 \mu[0]^2 q[1]^2 + 2 P[1] U[1]^2 q[1]^2 + \\
2 P[2] V[1]^2 q[1]^2 + 2 Q[1] q[1]^4;$$

$$\begin{aligned}
E11 := & -2 \lambda P[1] U[1]^2 \mu[0]^2 q[1]^2 - 2 \lambda P[2] V[1]^2 \mu[0]^2 q[1]^2 + \\
& 3 \lambda P[1] U[1]^2 q[1]^2 + 3 \lambda P[2] V[1]^2 q[1]^2 + 2 P[1] U[1] U[2] \mu[0] q[1]^2 + \\
& 2 P[2] V[1] V[2] \mu[0] q[1]^2 + 2 q_0 P[1] U[1]^2 q[1] + 2 q_0 P[2] V[1]^2 q[1] + \\
& 8 q_0 Q[1] q[1]^3 + 2 \mu[0] \omega[1] q[1]^2;
\end{aligned}$$

$$\begin{aligned}
E12 := & -\lambda^2 P[1] U[1]^2 \mu[0]^2 q[1]^2 - \lambda^2 P[2] V[1]^2 \mu[0]^2 q[1]^2 - \\
& 2 \mu P[1] U[1]^2 \mu[0]^2 q[1]^2 - 2 \mu P[2] V[1]^2 \mu[0]^2 q[1]^2 + \\
& 2 b_{-1} P[1] U[1]^2 \mu[0]^2 q[1] + 2 b_{-1} P[2] V[1]^2 \mu[0]^2 q[1] +
\end{aligned}$$

$$\begin{aligned}
& \lambda^2 P[1] U[1]^2 q[1]^2 + \lambda^2 P[2] V[1]^2 q[1]^2 + \\
& 2 \lambda P[1] U[1] U[2] \mu[0] q[1]^2 + 2 \lambda P[2] V[1] V[2] \mu[0] q[1]^2 + \\
& 3 \lambda q_{00} P[1] U[1]^2 q[1] + 3 \lambda q_{00} P[2] V[1]^2 q[1] + 2 \mu P[1] U[1]^2 q[1]^2 \\
& + 2 \mu P[2] V[1]^2 q[1]^2 + 2 q_{00} P[1] U[1] U[2] \mu[0] q[1] + \\
& 2 q_{00} P[2] V[1] V[2] \mu[0] q[1] + 2 b_{10} P[1] U[1]^2 q[1] + 2 b_{10} P[2] V[1]^2 q[1] + \\
& 8 b_{10} Q[1] q[1]^3 + 2 \lambda \mu[0] \omega[1] q[1]^2 + 12 q_{00}^2 Q[1] q[1]^2 - \\
& P[1] U[1]^2 q[1]^2 - P[2] V[2]^2 q[1]^2 + 2 q_{00} \mu[0] \omega[1] q[1] - R[2] q[1]^2 - \\
& 2 \omega[2] q[1]^2;
\end{aligned}$$

$$\begin{aligned}
E13 := & -2 \lambda \mu P[1] U[1]^2 \mu[0]^2 q[1]^2 - 2 \lambda \mu P[2] V[1]^2 \mu[0]^2 q[1]^2 + \\
& 4 b_{10} \lambda P[1] U[1]^2 \mu[0]^2 q[1] + 4 b_{10} \lambda P[2] V[1]^2 \mu[0]^2 q[1] + \\
& \lambda^2 q_{00} P[1] U[1]^2 q[1] + \lambda^2 q_{00} P[2] V[1]^2 q[1] + \\
& \lambda \mu P[1] U[1]^2 q[1]^2 + \lambda \mu P[2] V[1]^2 q[1]^2 + \\
& 2 \lambda q_{00} P[1] U[1] U[2] \mu[0] q[1] + 2 \lambda q_{00} P[2] V[1] V[2] \mu[0] q[1] + \\
& 2 \mu P[1] U[1] U[2] \mu[0] q[1]^2 + 2 \mu P[2] V[1] V[2] \mu[0] q[1]^2 + \\
& 4 b_{10} \lambda P[1] U[1]^2 q[1] + 4 b_{10} \lambda P[2] V[1]^2 q[1] + \\
& 2 \mu q_{00} P[1] U[1]^2 q[1] + 2 \mu q_{00} P[2] V[1]^2 q[1] + 24 b_{10} q_{00} Q[1] q[1]^2 + \\
& 2 \lambda q_{00} \mu[0] \omega[1] q[1] + 2 \mu \mu[0] \omega[1] q[1]^2 + 8 q_{00}^3 Q[1] q[1] - \\
& 2 q_{00} P[1] U[1]^2 q[1] - 2 q_{00} P[2] V[2]^2 q[1] - 2 q_{00} R[2] q[1] - 4 q_{00} \omega[2] q[1];
\end{aligned}$$

$$\begin{aligned}
E14 := & 2 b_{10} \lambda^2 P[1] U[1]^2 \mu[0]^2 q[1] + \\
& 2 b_{10} \lambda^2 P[2] V[1]^2 \mu[0]^2 q[1] - \mu^2 P[1] U[1]^2 \mu[0]^2 q[1]^2 - \\
& \mu^2 P[2] V[1]^2 \mu[0]^2 q[1]^2 + 4 b_{10} \mu P[1] U[1]^2 \mu[0]^2 q[1] + \\
& 4 b_{10} \mu P[2] V[1]^2 \mu[0]^2 q[1] - b_{10}^2 P[1] U[1]^2 \mu[0]^2 - \\
& b_{10}^2 P[2] V[1]^2 \mu[0]^2 + 2 b_{10} \lambda^2 P[1] U[1]^2 q[1] + \\
& 2 b_{10} \lambda^2 P[2] V[1]^2 q[1] + \lambda \mu q_{00} P[1] U[1]^2 q[1] + \\
& \lambda \mu q_{00} P[2] V[1]^2 q[1] + 2 \mu q_{00} P[1] U[1] U[2] \mu[0] q[1] + \\
& 2 \mu q_{00} P[2] V[1] V[2] \mu[0] q[1] + b_{10} \lambda q_{00} P[1] U[1]^2 + \\
& b_{10} \lambda q_{00} P[2] V[1]^2 + 4 b_{10} \mu P[1] U[1]^2 q[1] + 4 b_{10} \mu P[2] V[1]^2 q[1] - \\
& 2 b_{10} q_{00} P[1] U[1] U[2] \mu[0] - 2 b_{10} q_{00} P[2] V[1] V[2] \mu[0] + \\
& 12 b_{10}^2 Q[1] q[1]^2 + 24 b_{10} q_{00}^2 Q[1] q[1] - 2 b_{10} P[1] U[1]^2 q[1] - \\
& 2 b_{10} P[2] V[2]^2 q[1] + 2 \mu q_{00} \mu[0] \omega[1] q[1] + 2 q_{00}^4 Q[1] - \\
& q_{00}^2 P[1] U[1]^2 - q_{00}^2 P[2] V[2]^2 - 2 b_{10} q_{00} \mu[0] \omega[1] - 2 b_{10} R[2] q[1] - \\
& 4 b_{10} \omega[2] q[1] - q_{00}^2 R[2] - 2 q_{00}^2 \omega[2];
\end{aligned}$$

$$\begin{aligned}
E15 := & 4 b_{10} \lambda \mu P[1] U[1]^2 \mu[0]^2 q[1] + \\
& 4 b_{10} \lambda \mu P[2] V[1]^2 \mu[0]^2 q[1] - 2 b_{10}^2 \lambda P[1] U[1]^2 \mu[0]^2 - \\
& 2 b_{10}^2 \lambda P[2] V[1]^2 \mu[0]^2 + b_{10} \lambda^2 q_{00} P[1] U[1]^2 + \\
& b_{10} \lambda^2 q_{00} P[2] V[1]^2 + 4 b_{10} \lambda \mu P[1] U[1]^2 q[1] + \\
& 4 b_{10} \lambda \mu P[2] V[1]^2 q[1] - 2 b_{10} \lambda q_{00} P[1] U[1] U[2] \mu[0] - \\
& 2 b_{10} \lambda q_{00} P[2] V[1] V[2] \mu[0] + b_{10}^2 \lambda P[1] U[1]^2 + \\
& b_{10}^2 \lambda P[2] V[1]^2 - 2 b_{10}^2 P[1] U[1] U[2] \mu[0] - 2 b_{10}^2 P[2] V[1] V[2] \mu[0] \\
& + 2 b_{10} \mu q_{00} P[1] U[1]^2 + 2 b_{10} \mu q_{00} P[2] V[1]^2 + 24 b_{10}^2 q_{00} Q[1] q[1] - \\
& 2 b_{10} \lambda q_{00} \mu[0] \omega[1] + 8 b_{10} q_{00}^3 Q[1] - 2 b_{10} q_{00} P[1] U[1]^2 - \\
& 2 b_{10} q_{00} P[2] V[2]^2 - 2 b_{10}^2 \mu[0] \omega[1] - 2 b_{10} q_{00} R[2] - \\
& 4 b_{10} q_{00} \omega[2];
\end{aligned}$$

$$\begin{aligned}
E16 := & -b_1^2 \lambda^2 P[1] U[1]^2 \mu[0]^2 - b_1^2 \lambda^2 P[2] V[1]^2 \mu[0]^2 + \\
& 2 b_1 \mu^2 P[1] U[1]^2 \mu[0]^2 q[1] + 2 b_1 \mu^2 P[2] V[1]^2 \mu[0]^2 q[1] - \\
& 2 b_1^2 \mu P[1] U[1]^2 \mu[0]^2 - 2 b_1^2 \mu P[2] V[1]^2 \mu[0]^2 + \\
& b_1^2 \lambda^2 P[1] U[1]^2 + b_1^2 \lambda^2 P[2] V[1]^2 - \\
& 2 b_1^2 \lambda^2 P[1] U[1] U[2] \mu[0] - 2 b_1^2 \lambda^2 P[2] V[1] V[2] \mu[0] + \\
& 3 b_1 \lambda \mu q_0 P[1] U[1]^2 + 3 b_1 \lambda \mu q_0 P[2] V[1]^2 + \\
& 2 b_1 \mu^2 P[1] U[1]^2 q[1] + 2 b_1 \mu^2 P[2] V[1]^2 q[1] - \\
& 2 b_1 \mu q_0 P[1] U[1] U[2] \mu[0] - 2 b_1 \mu q_0 P[2] V[1] V[2] \mu[0] + \\
& 2 b_1^2 \mu P[1] U[1]^2 + 2 b_1^2 \mu P[2] V[1]^2 + 8 b_1^3 Q[1] q[1] - \\
& 2 b_1^2 \lambda \mu[0] \omega[1] + 12 b_1^2 q_0^2 Q[1] - b_1^2 P[1] U[1]^2 - \\
& b_1^2 P[2] V[2]^2 - 2 b_1 \mu q_0 \mu[0] \omega[1] - b_1^2 R[2] - 2 b_1^2 \omega[2];
\end{aligned}$$

$$\begin{aligned}
E17 := & -2 b_1^2 \lambda \mu P[1] U[1]^2 \mu[0]^2 - 2 b_1^2 \lambda \mu P[2] V[1]^2 \mu[0]^2 \\
& + 3 b_1^2 \lambda \mu P[1] U[1]^2 + 3 b_1^2 \lambda \mu P[2] V[1]^2 - \\
& 2 b_1^2 \mu P[1] U[1] U[2] \mu[0] - 2 b_1^2 \mu P[2] V[1] V[2] \mu[0] + \\
& 2 b_1 \mu^2 q_0 P[1] U[1]^2 + 2 b_1 \mu^2 q_0 P[2] V[1]^2 + 8 b_1^3 q_0 Q[1] - \\
& 2 b_1^2 \mu \mu[0] \omega[1];
\end{aligned}$$

$$\begin{aligned}
E18 := & -b_1^2 \mu^2 P[1] U[1]^2 \mu[0]^2 - b_1^2 \mu^2 P[2] V[1]^2 \mu[0]^2 + \\
& 2 b_1^2 \mu^2 P[1] U[1]^2 + 2 b_1^2 \mu^2 P[2] V[1]^2 + 2 b_1^4 Q[1];
\end{aligned}$$

solve({E1 = 0, E10 = 0, E11 = 0, E12 = 0, E13 = 0, E14 = 0, E15 = 0, E16 = 0, E17 = 0, E18 = 0, E2 = 0, E3 = 0, E4 = 0, E5 = 0, E6 = 0, E7 = 0, E8 = 0, E9 = 0}, [U[1], U[2], V[1], V[2], omega[1], omega[2], mu[0], lambda, mu, q[0], q[1], b__1], AllSolutions = true, Explicit = true);

[]