APPENDIX A

TRANSFER FUNCTION MATRIX OF LINEAR PART OF THE SYSTEM (3.24)-(3.25)

The transfer function matrix of linear part of the system described by a pair of equations (3.24)-(3.25) in Chapter III is given by

\[ G(s) = C(sI - A_1)^{-1}B \]  

where \( A_1 \) is the system matrix after the pole shifting manipulation is employed and is given below:

\[ A_1 = \begin{bmatrix} M^1D & -B_1 \Delta C_2 \\ 0 & \end{bmatrix} \]  

(A.2)

Then \( [sI - A_1]^{-1} \) is given by

\[ [sI - A_1]^{-1} = \begin{bmatrix} \frac{sI + \lambda + \frac{1}{s}(B_1\Delta C_2)}{sI + \lambda + \frac{1}{s}M^{-1}T_{nn}} \end{bmatrix}^{-1} \]  

(say) (A.3)

Then

\[ [sI - A_1]^{-1} = \begin{bmatrix} c_1 & \vdots & c_2 \\ \vdots & \ddots & \vdots \\ c_3 & \ldots & c_n \end{bmatrix} \]

where

\[ c_1 = \frac{\lambda + \frac{1}{s}(B_1\Delta C_2)}{sI + \lambda + \frac{1}{s}M^{-1}T_{nn}} \]  

(A.4)

with \( B_1\Delta C_2 = M^{-1}T_{nn} \)  

(A.5)

\( T_{nn} \) is a positive semidefinite matrix of the order \( nxn \) given as follows:
From equations (A.7) and (A.8) we get

\[ G_1(s) = c_2 [s^2 \cdot \text{M} + s(-D) + T]^{-1} c_2^T \]