

**Topic: Check of properties of controllability and observability
by R. Kallman's criteria**

Tack Investigate a dynamic system on controllability and observability by R. Kallman criteria if the mathematical description of a system is given in the state-space in the following look:

$$\begin{cases} \dot{x} = Ax + Bu \\ y = Cx \end{cases},$$

where matrix A , B , C are matrixes with constant coefficients (on variants).

Variants:

1)

$$A = \begin{vmatrix} 1 & 3 \\ 7 & 5 \end{vmatrix}, \quad B = \begin{vmatrix} -1 \\ 3 \end{vmatrix}, \quad C = \begin{vmatrix} 2 \\ 4 \end{vmatrix}.$$

2)

$$A = \begin{vmatrix} -5 & 3 \\ 3 & -5 \end{vmatrix}, \quad B = \begin{vmatrix} 1 \\ 3 \end{vmatrix}, \quad C = \begin{vmatrix} -1 \\ 2 \end{vmatrix}.$$

3)

$$A = \begin{vmatrix} 9 & 9 \\ 2 & 6 \end{vmatrix}, \quad B = \begin{vmatrix} -2 \\ -3 \end{vmatrix}, \quad C = \begin{vmatrix} 3 \\ -4 \end{vmatrix}.$$

4)

$$A = \begin{vmatrix} 1 & -1 \\ 7 & 9 \end{vmatrix}, \quad B = \begin{vmatrix} -7 \\ 2 \end{vmatrix}, \quad C^T = \begin{vmatrix} 1 & 2 \end{vmatrix}.$$

5)

$$A = \begin{vmatrix} 3 & 5 \\ 11 & 9 \end{vmatrix}, \quad B = \begin{vmatrix} 7 \\ -2 \end{vmatrix}, \quad C^T = \begin{vmatrix} 4 & -3 \end{vmatrix}.$$

6)

$$A = \begin{vmatrix} -3 & 4 \\ 6 & -5 \end{vmatrix}, \quad B = \begin{vmatrix} 2 \\ -3 \end{vmatrix}, \quad C = \begin{vmatrix} 5 \\ -4 \end{vmatrix}.$$

7)

$$A = \begin{vmatrix} 3 & 4 \\ 8 & 7 \end{vmatrix}, \quad B = \begin{vmatrix} -2 \\ 5 \end{vmatrix}, \quad C = \begin{vmatrix} 9 \\ -1 \end{vmatrix}.$$

8)

$$A = \begin{vmatrix} 2 & 3 \\ 8 & 4 \end{vmatrix}, \quad B = \begin{vmatrix} -2 \\ -5 \end{vmatrix}, \quad C^T = \begin{vmatrix} 7 & -3 \end{vmatrix}.$$

9)

$$A = \begin{vmatrix} 2 & 3 \\ -1 & 6 \end{vmatrix}, \quad B = \begin{vmatrix} 2 \\ -4 \end{vmatrix}, \quad C^T = \begin{vmatrix} 5 & -7 \end{vmatrix}.$$

10)

$$A = \begin{vmatrix} 1 & 3 \\ 5 & 3 \end{vmatrix}, \quad B = \begin{vmatrix} -5 \\ -3 \end{vmatrix}, \quad C = \begin{vmatrix} 1 \\ -4 \end{vmatrix}.$$

11)

$$A = \begin{vmatrix} -4 & 5 \\ 5 & -4 \end{vmatrix}, \quad B = \begin{vmatrix} 2 \\ -6 \end{vmatrix}, \quad C = \begin{vmatrix} 2 \\ -4 \end{vmatrix}.$$

12)

$$A = \begin{vmatrix} 1 & -1 \\ 2 & 4 \end{vmatrix}, \quad B = \begin{vmatrix} 2 \\ 3 \end{vmatrix}, \quad C = \begin{vmatrix} -6 \\ -1 \end{vmatrix}.$$