Consider the \((A, B, C, D)\) SISO system,\[
\dot{x}(t) = Ax(t) + bu(t) \\
y(t) = c' x(t),
\]
with\[
A = \begin{bmatrix} 1 & \alpha \\ 0 & 1 \end{bmatrix}, \quad b = \begin{bmatrix} 1 \\ 1 \end{bmatrix}, \quad c' = \begin{bmatrix} 1 & 1 \end{bmatrix}.
\]

1) What is the controllability matrix of this system?

2) For what values of \(\alpha\) is the system controllable?

3) What is the observability matrix of this system?

4) For what values of \(\alpha\) is the system observable?