

Assignment 0

1 > Is the following function positive definite?

$$V(x_1, x_2) = 2x_1^2 + x_2^2 + 2x_1x_2$$

2> Write down the state-space model of the following transfer function.

$$\frac{Y(s)}{U(s)} = \frac{s}{s+2}$$

3> Find out the equilibrium points of the following dynamical systems.

$$\begin{aligned}\dot{x}_1 &= -x_1^3 + x_1x_2 \\ \dot{x}_2 &= x_1^2\end{aligned}$$

4> Linearize the following nonlinear systems around their equilibrium points and comment on the stability of each equilibrium point.

a> $\dot{x} = x^3 - x$

b> $\dot{x} = \sin(x)$