Lecture 11

Monday, 13 February 2023 10:04 AM

SISO
single input, single output

MISO
multiple input, single output
use superposition

SIMO
single input, mutiple output
use circuit analysis

MIMO
mutiple input, mutiple output
all of the above

1 Laplace

Linear algebra

Matrix Form of

$$\cancel{\frac{\bar{Y}}{\bar{U}} = \bar{\bar{G}}}$$

matrix

$$\bar{Y} = \bar{\bar{G}}\,\bar{U}$$

vector

MIMO

$$\frac{Y}{U} = G$$

SISO

I_D Independent states x_1 x

linear combination o

$_2 \;\ldots$

f the others.

no states are ...

Combine them $\bar{x} = [x_1, x_2]^T$

State eqns (matrix form) $\dot{\bar{x}} = [\dot{x}_1 \ \dot{x}_2 \cdots]^T = \bar{\bar{A}}$

O/P eqns $\bar{y} = [y_1 \ y_2 \cdots]^T = \bar{\bar{C}}\bar{x}$

$$s\bar{x} = \bar{\bar{A}}\bar{x} + \bar{\bar{B}}\bar{u}$$

$\downarrow$

$$s\bar{\bar{I}}\bar{x} = \bar{\bar{A}}\bar{x} + B\bar{u}$$

$$(s\bar{\bar{I}} - \bar{\bar{A}})\bar{x} = \bar{\bar{B}}u$$

$$\bar{x} + \bar{\bar{B}}\,\bar{u} \qquad \boxed{\dot{x} = \frac{dx}{dt}}$$

$$+ \bar{\bar{D}}\,\bar{u}$$

$(sI \;\; A)X \quad B$

$$\bar{X} = (\underbrace{(s\bar{\bar{I}} - \bar{\bar{A}})}\bar{\bar{B}})\bar{u}$$

ϕ just simple symbol to

$$\bar{X} = \bar{\bar{\phi}}\,\bar{\bar{B}}\,\bar{\bar{u}}$$

$$\bar{y} = \bar{\bar{C}}\,\bar{\bar{\phi}}\,\bar{\bar{B}}\,\bar{u} + \bar{\bar{D}}\,\bar{u}$$

$$\bar{y} = \underbrace{(\bar{\bar{C}}\,\bar{\bar{\phi}}\,\bar{\bar{B}} + \bar{\bar{D}})}_{\bar{\bar{G}}}\,\bar{u}$$

write that.

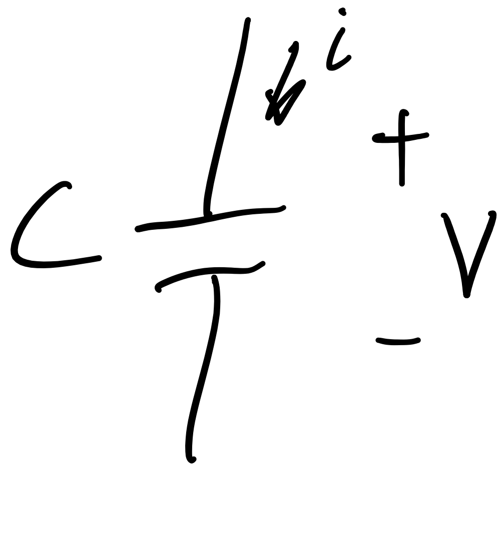
Solve for A B C D

States

- stored Energy
- AKA Initial condit

$\underline{x}$

v



l i

tions

$$\dot{x}$$

$$i = C\frac{dv}{dt} \qquad i = C\dot{v}$$