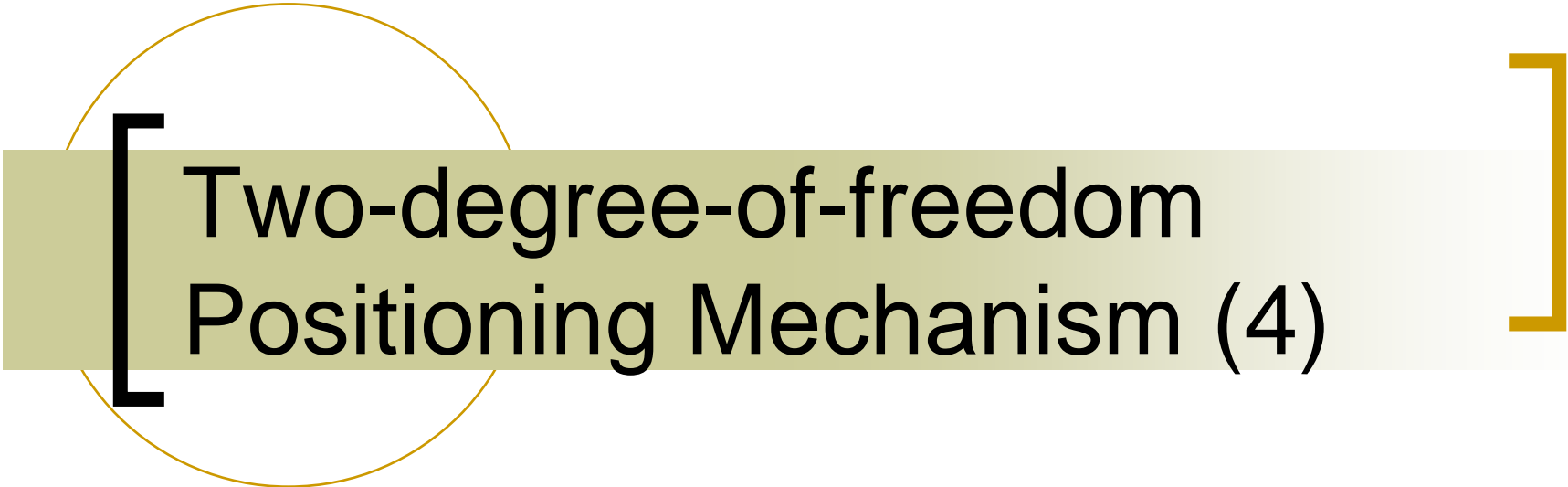


# Fundamentals of Dynamics (7)

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# Two-degree-of-freedom Positioning Mechanism (4)

# [ Access Control (1) ]

Access Control Force  $f_1(t) = 0$  for  $t > T$

$$(f_2(t) = 0 \text{ for } -\infty < t < \infty)$$

Initial Condition  $x_1(0) = x_2(0) = 0, \dot{x}_1(0) = \dot{x}_2(0) = 0$

Final Condition  $x_1(T) = x_2(T) = S, \dot{x}_1(T) = \dot{x}_2(T) = 0$

where

No residual vibration

$T$  : Access Time (s)

$S$  : Access Stroke (m)

# [Access Control (2)]

Final Condition for each mode

$$y_1(T) = \frac{S}{\alpha}, \dot{y}_1(T) = 0$$

$$y_2(T) = 0, \dot{y}_2(T) = 0$$

No residual vibration

# [ Access Control (3) ]

Modal Equation of Motion

$$\ddot{y}_2 + \lambda_2 y_2 = \beta f_1$$

Stationary Initial Condition

$$y_2(0) = 0, \dot{y}_2(0) = 0$$

Transient Response of the Vibration mode

$$y_2(t) = \frac{\beta}{\omega_2} \int_0^t \sin\{\omega_2(t - \tau)\} f_1(\tau) d\tau$$

$$\dot{y}_2(t) = \beta \int_0^t \cos\{\omega_2(t - \tau)\} f_1(\tau) d\tau$$

# [ Access Control (4) ]

Amplitude of Residual Vibration

$$A_R = \sqrt{\{y_2(T)\}^2 + \left\{\frac{\dot{y}_2(T)}{\omega_2}\right\}^2} = \frac{|\beta|}{\omega_2} |F(i\omega_2)|$$

where

$$F(i\omega) = \int_{-\infty}^{\infty} f_1(t) \exp(-i\omega t) dt$$

# [ Access Control (5) ]

No Residual Vibration Condition

$$y_2(T) = 0, \dot{y}_2(T) = 0 \longleftrightarrow |F(i\omega_2)| = 0$$

# [ Access Control (6) ]

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(a) Multi-switch Bang-Bang Control

(b) Dead Beat Control