

교재 : D. J. Inman, Engineering Vibration, 4th edition, Pearson, 2014.

4.1절 <4.1> 
$$\begin{bmatrix} m_1 & 0 \\ 0 & m_2 \end{bmatrix} \begin{Bmatrix} \ddot{x}_1(t) \\ \ddot{x}_2(t) \end{Bmatrix} + \begin{bmatrix} k_1 + k_2 & -k_2 \\ -k_2 & k_2 + k_3 \end{bmatrix} \begin{Bmatrix} x_1(t) \\ x_2(t) \end{Bmatrix} = \begin{Bmatrix} 0 \\ 0 \end{Bmatrix}$$

<4.2>  $\omega_1 = 1.554 \text{ rad/s}, \omega_2 = 1.990 \text{ rad/s}$

<4.3>  $\mathbf{u}_1 = \begin{Bmatrix} 0.39 \\ 1 \end{Bmatrix}, \mathbf{u}_2 = \begin{Bmatrix} -0.64 \\ 1 \end{Bmatrix}$

<4.4>  $x_1(t) = 0.379 \cos(1.554 t) + 0.621 \cos(1.990 t)$

$x_2(t) = 0.971 \cos(1.554 t) - 0.971 \cos(1.990 t)$

<4.5>  $x_1(t) = 0.1654 \sin(1.278 t) + 0.430 \sin(1.834 t)$

$x_2(t) = 0.904 \sin(1.278 t) - 0.630 \sin(1.834 t)$

<4.6> 
$$\begin{bmatrix} m_1 & 0 \\ 0 & m_2 \end{bmatrix} \begin{Bmatrix} \ddot{x}_1(t) \\ \ddot{x}_2(t) \end{Bmatrix} + \begin{bmatrix} k & -k \\ -k & k \end{bmatrix} \begin{Bmatrix} x_1(t) \\ x_2(t) \end{Bmatrix} = \begin{Bmatrix} 0 \\ 0 \end{Bmatrix}$$

<4.7>  $\omega_1 = 0, \omega_2 = 3.54 \text{ rad/s}$       <4.8>  $\omega_1 = 0.255 \text{ rad/s}, \omega_2 = 1.239 \text{ rad/s}$

<4.9>  $x_1(t) = \frac{1}{3} \cos \sqrt{2} t, x_2(t) = \cos \sqrt{2} t.$

Both masses oscillate at only one frequency.

<4.10>  $x_1(t) = -\frac{1}{3} \cos 2t, x_2(t) = \cos 2t$

Both masses oscillate at only one frequency.

<4.11>  $\omega_1 = 0, \omega_2 = 4.472 \text{ rad/s}$

<4.12>  $\omega_1 = 0.482 \sqrt{\frac{k}{J_2}}, \omega_2 = 1.198 \sqrt{\frac{k}{J_2}}, \mathbf{u}_1 = \begin{Bmatrix} 0.768 \\ 1 \end{Bmatrix}, \mathbf{u}_2 = \begin{Bmatrix} -0.434 \\ 1 \end{Bmatrix}$

<4.13>  $\omega_1 = 0 \text{ rad/s}, \omega_2 = 16.04 \text{ rad/s}, \mathbf{u}_1 = \begin{Bmatrix} 1 \\ 1 \end{Bmatrix}, \mathbf{u}_2 = \begin{Bmatrix} 1 \\ -1 \end{Bmatrix}$

<4.14>  $x_1(t) = 0.025 - 0.025 \cos(16.04 t)$

$x_2(t) = 0.025 + 0.025 \cos(16.04 t)$

<4.15>  $\omega_1 = 0.618 \text{ rad/s}, \omega_2 = 13.54 \text{ rad/s}$

<4.16> 생략      <4.17> 생략      <4.18> 생략      <4.19> 생략

1.6절 <1.94>  $\omega_d = 1.571 \text{ rad/s}, \zeta = 0.1986, \omega_n = 1.603 \text{ rad/s}$

<1.95> 증명 (노트)      <1.96> 생략

<1.97>  $E = 564 \times 10^9 \text{ N/m}^2$       <1.98>  $c = 16,200 \text{ N}\cdot\text{s/m}$

<1.99>  $\zeta = 0.215$       <1.100>  $\zeta = 0.25$  일 때, 3.2% 오차

<1.101>  $c = 16.70 \text{ N}\cdot\text{s/m}$