

본 사이트에서 수업 자료로 이용되는 저작물은 **저작권법 제25조 수업목적저작물 이용 보상금제도**에 의거, **한국복제전송저작권협회와 약정을 체결하고** 적법하게 이용하고 있습니다. 약정범위를 초과하는 사용은 저작권법에 저촉될 수 있으므로 **수업자료의 대중 공개·공유 및 수업 목적 외의 사용을 금지합니다.**

2014. 03. 24.

동아대학교·한국복제전송저작권협회

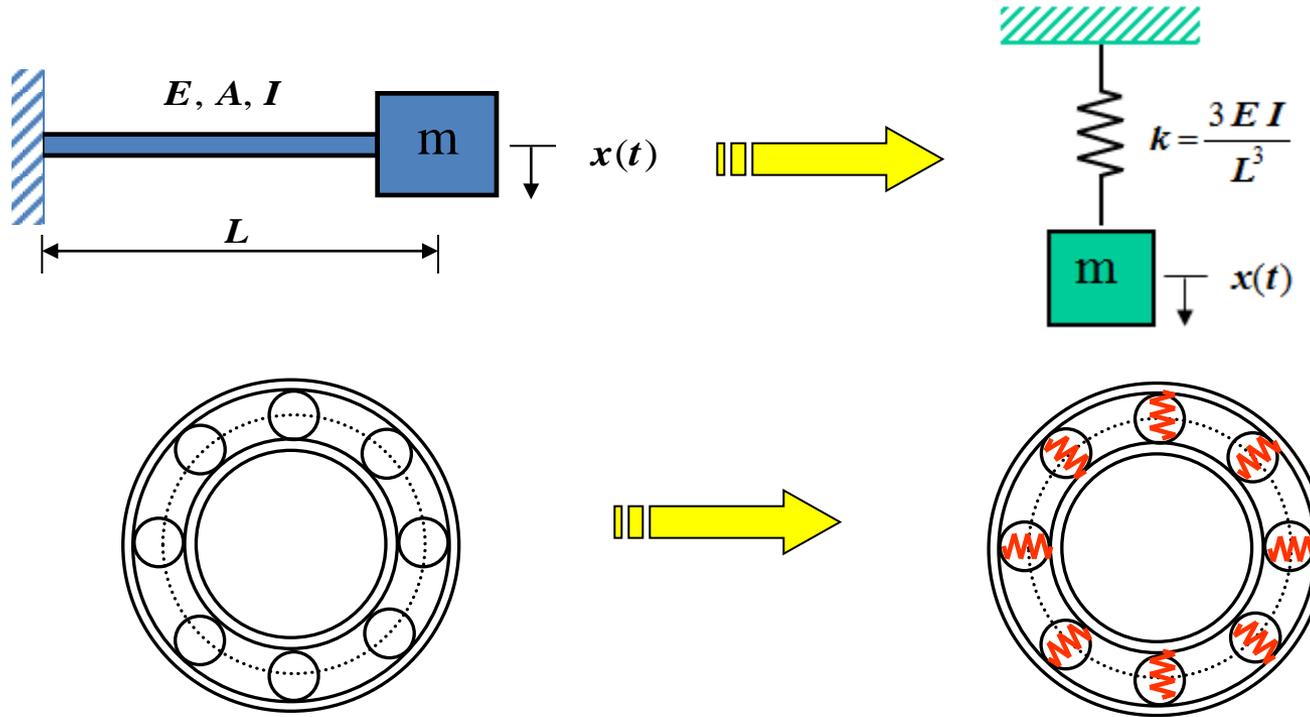
# 기계 진동 개요

1. 진동이란 (vibration)
2. 진동관련 변수 (vibration parameter)
3. 진동 응답 (vibration response)
4. 진동 구성 (configuration of vibration)
5. 사운드 (sound)

# 1. 진동이란 ?

- Interplay between potential energy and kinetic energy

# (1) Spring



## **(2) Mass (Inertia)**

## **(3) Damper**

- **viscous damping :**

  - : most commonly used damping mechanism

- **Coulomb damping (dry friction damping)**

- **material (solid or hysteretic) damping**

  - : hysteresis loop of stress-strain diagram

◆ **Classification of vibration**

- **Free vibration :**

- **Force vibration :**

- **Linear vibration :**

- **Nonlinear vibration :**

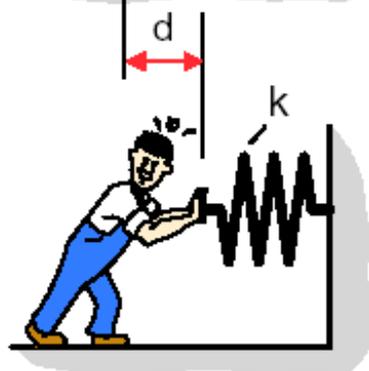
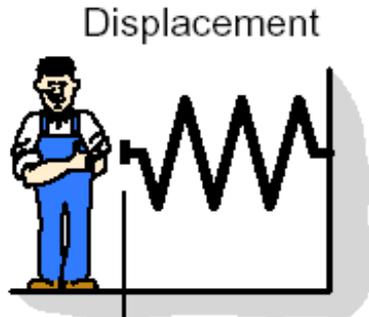
- **Deterministic vibration :**

- **Random vibration :**

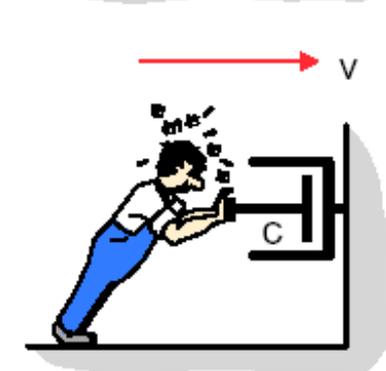
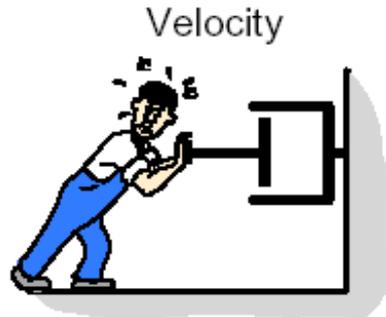
- **Undamped vibration :**

- **Damped vibration :**

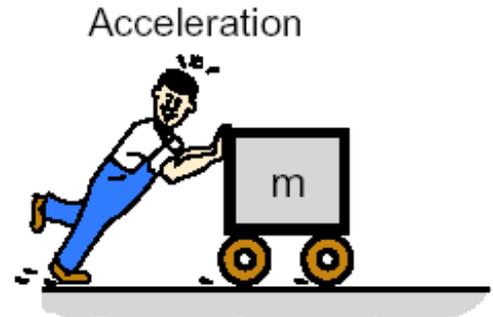
## 2. 진동 변수



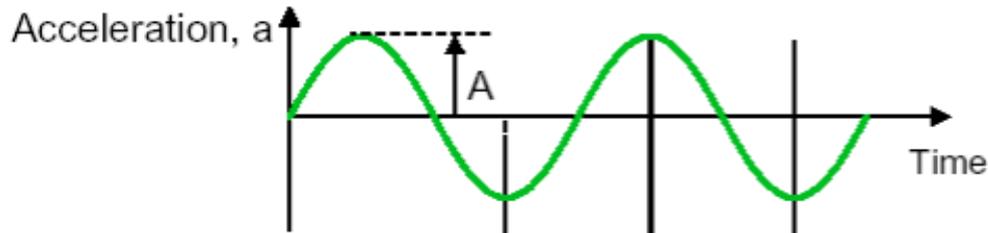
$$F = k \times d$$



$$F = c \times v$$

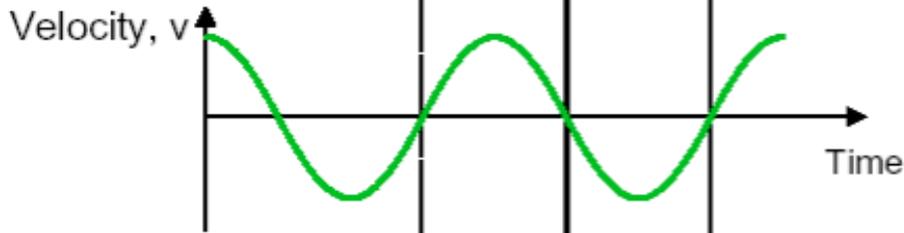


$$F = m \times a$$



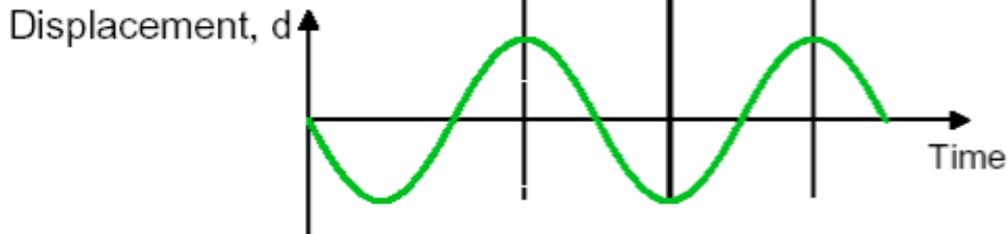
$$a = A \sin \omega t$$

$$a = A$$



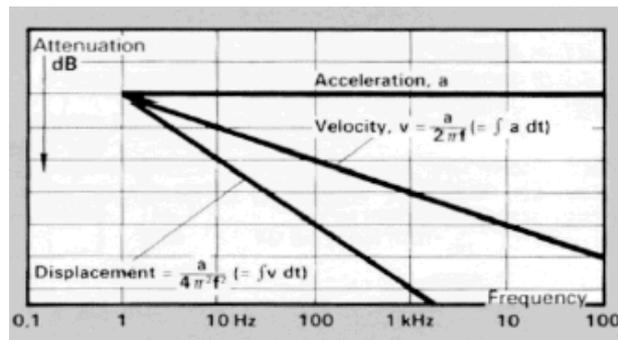
$$v = \int a \, dt = -\frac{A}{\omega} \cos \omega t$$

$$v = \frac{A}{\omega} = \frac{A}{2\pi f}$$

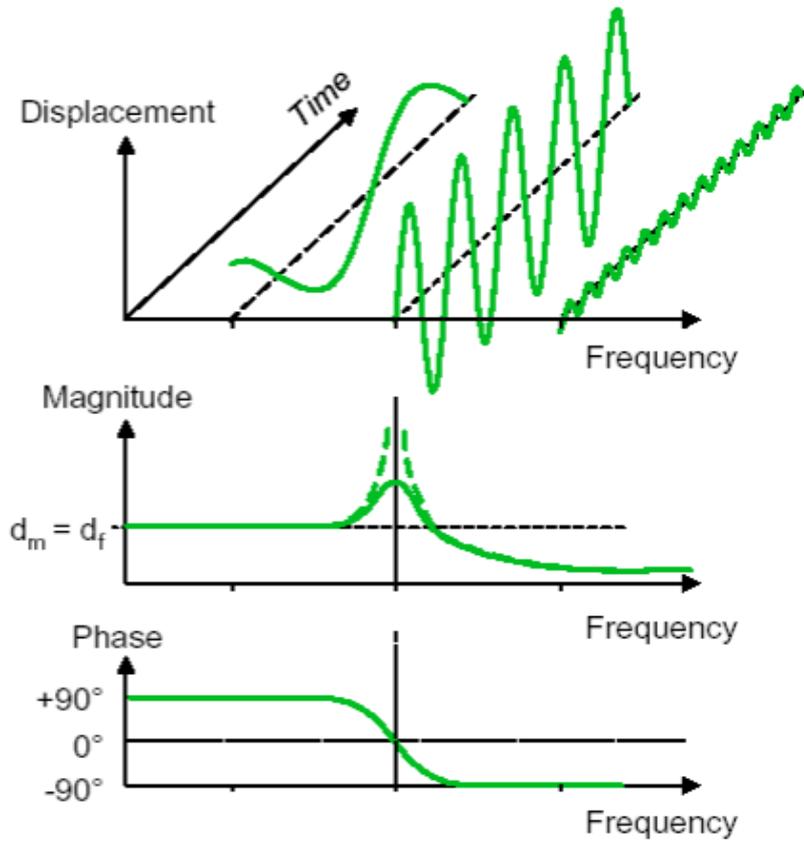
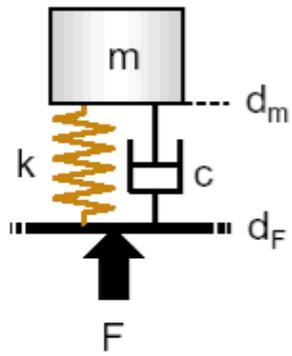


$$d = \iint a \, dt \, dt = -\frac{A}{\omega^2} \sin \omega t$$

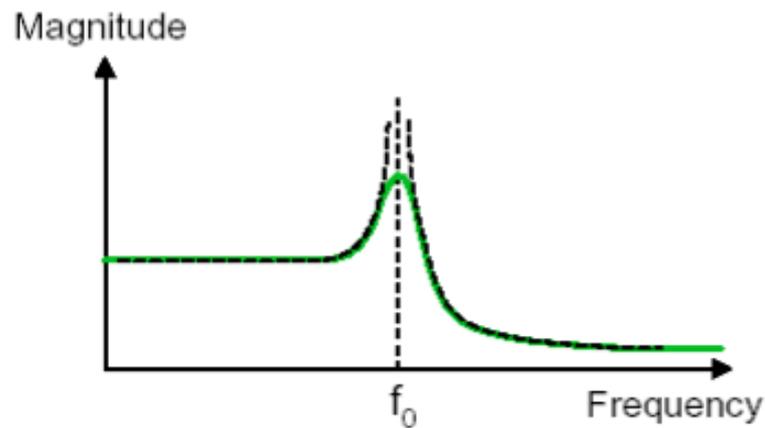
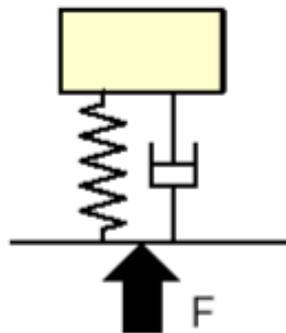
$$d = \frac{A}{\omega^2} = \frac{A}{4\pi^2 f^2}$$



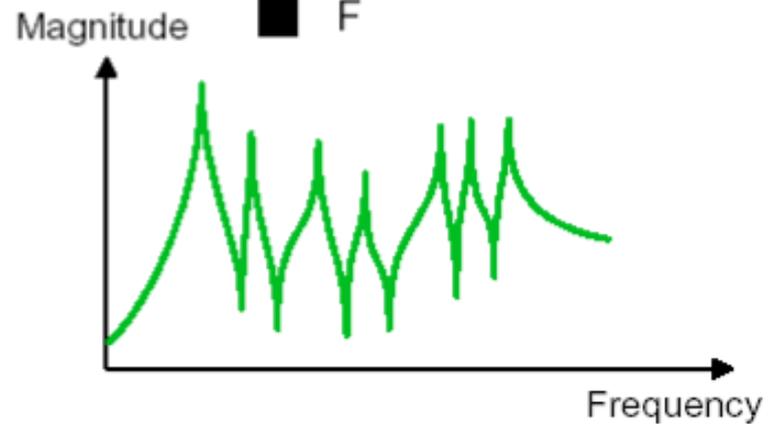
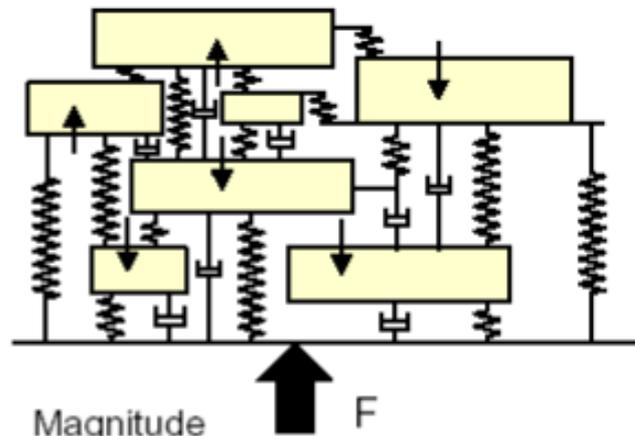
### 3. 진동 응답

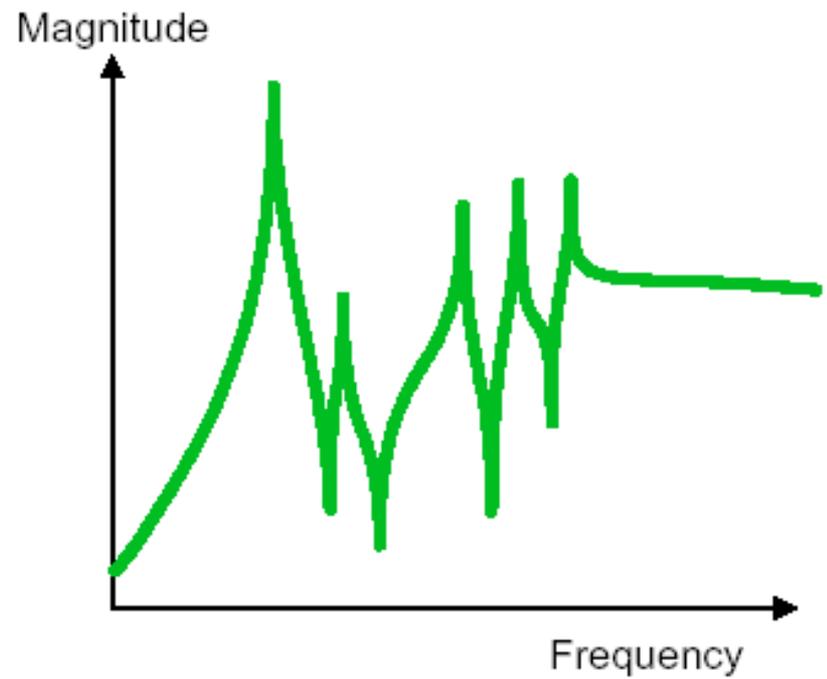
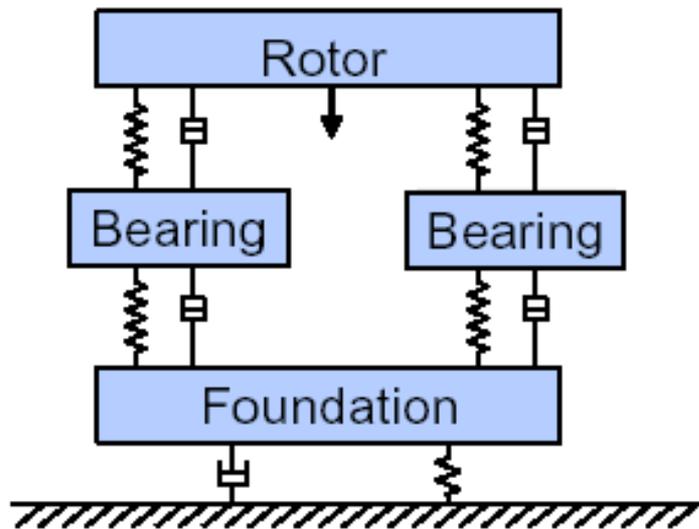


Single Degree of Freedom  
SDOF



Multi Degree of Freedom  
MDOF





#### 4. 진동 구성

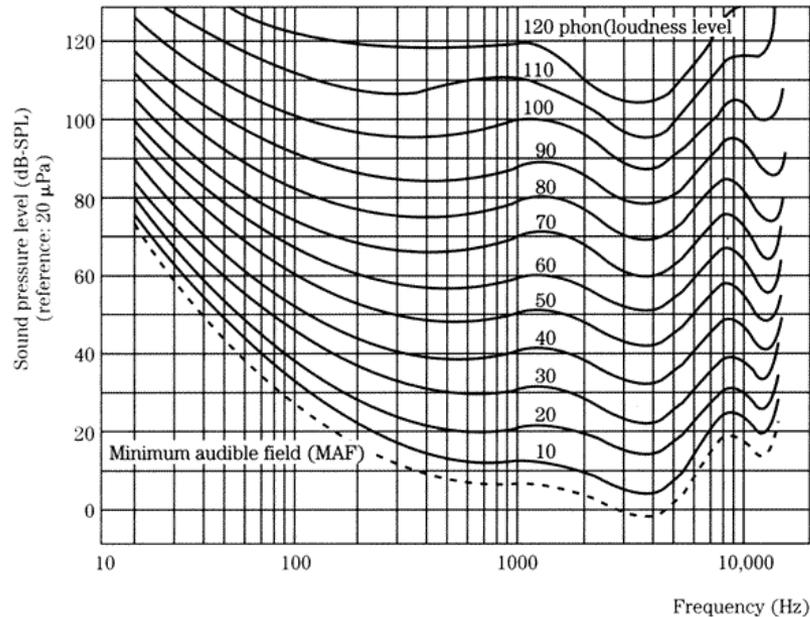


**active parameters**

**passive parameters**

## 5. 사운드

: mechanical vibration of an *elastic material medium*



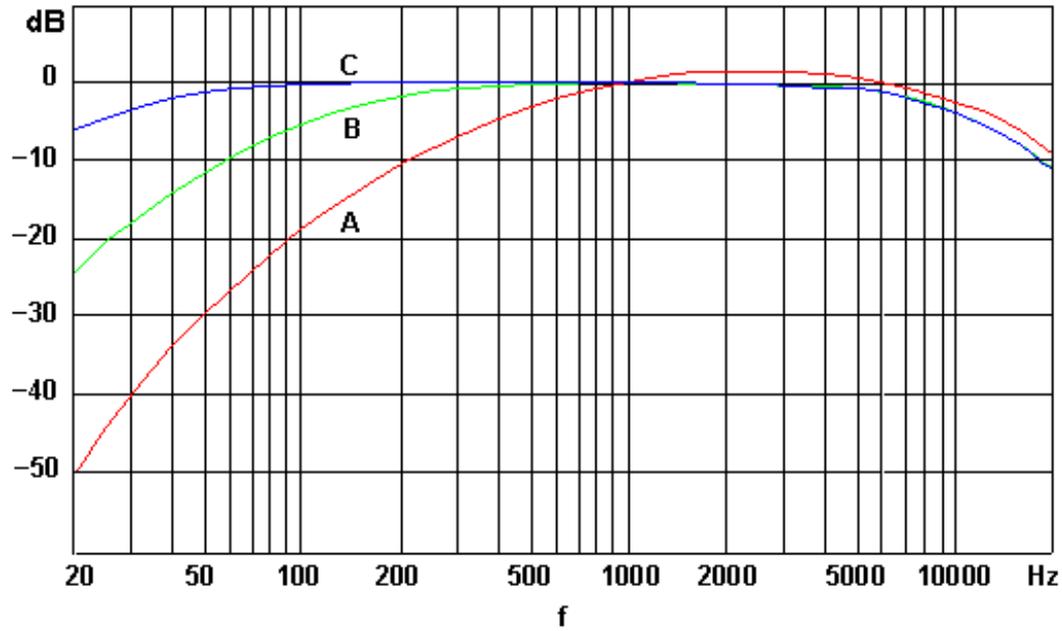
- Robinson-Dadson curve -

SPL (Sound Pressure Level) :

$$L_p = 20 \log \frac{P}{P_{ref}} \quad (dB)$$

$$P_{ref} = 20 \mu Pa$$

◆ A,B,C frequency weighting contour -



## ※ Reduction of noise and vibration

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