Mechanical Vibration I (10)

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Vibration Isolator and Servo Mechanism

Vibration isolator (1)

Base excitation

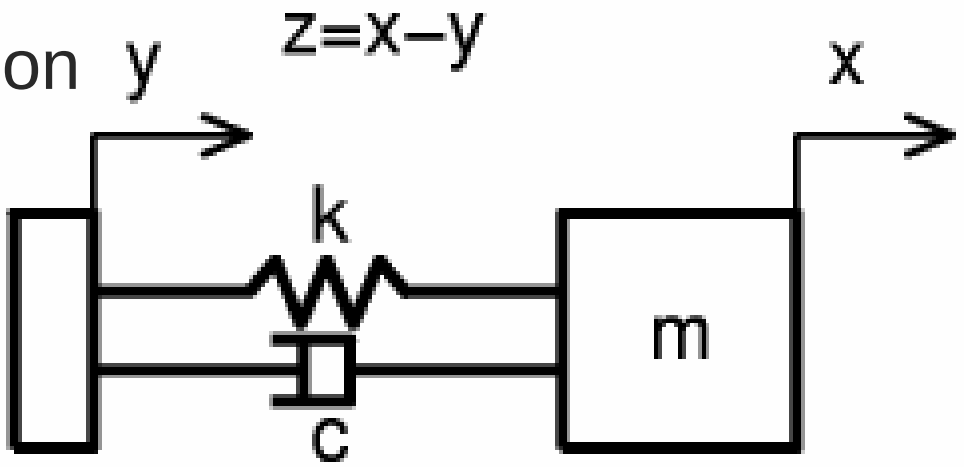

Fig.2 One degree-of-freedom vibration system with base excitation

Absolute displacement x

$$m\ddot{x} + c\dot{x} + kx = c\dot{y} + ky$$

Vibration isolator (2)

Vibration isolation effect

$$\omega > \sqrt{2}\,\omega_n$$

Maximum Gain

$$\approx \sqrt{\frac{1+4\zeta^2}{4\zeta^2}}$$

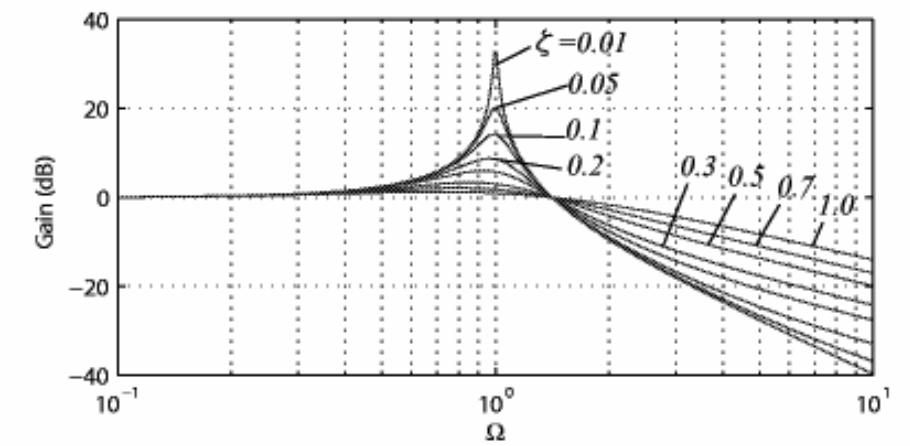

Fig.3 Frequency response function of $\frac{X(i\omega)}{Y}$

Servo mechanism (1)

Reference signal y

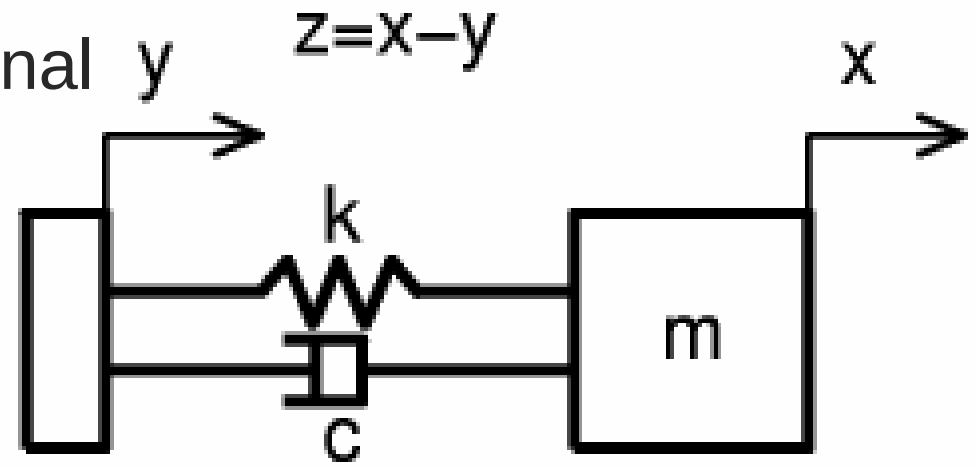

Fig.2 One degree-of-freedom vibration system with base excitation

Tracking Error z

$$m\ddot{z} + c\dot{z} + kz = -m\ddot{y}$$

Servo mechanism (2)

Servo bandwidth

$$0 < \omega < \omega_n$$

In case of

$$\omega << \omega_n$$

$$\text{Gain} \approx \left(\frac{\omega}{\omega_n} \right)^2$$

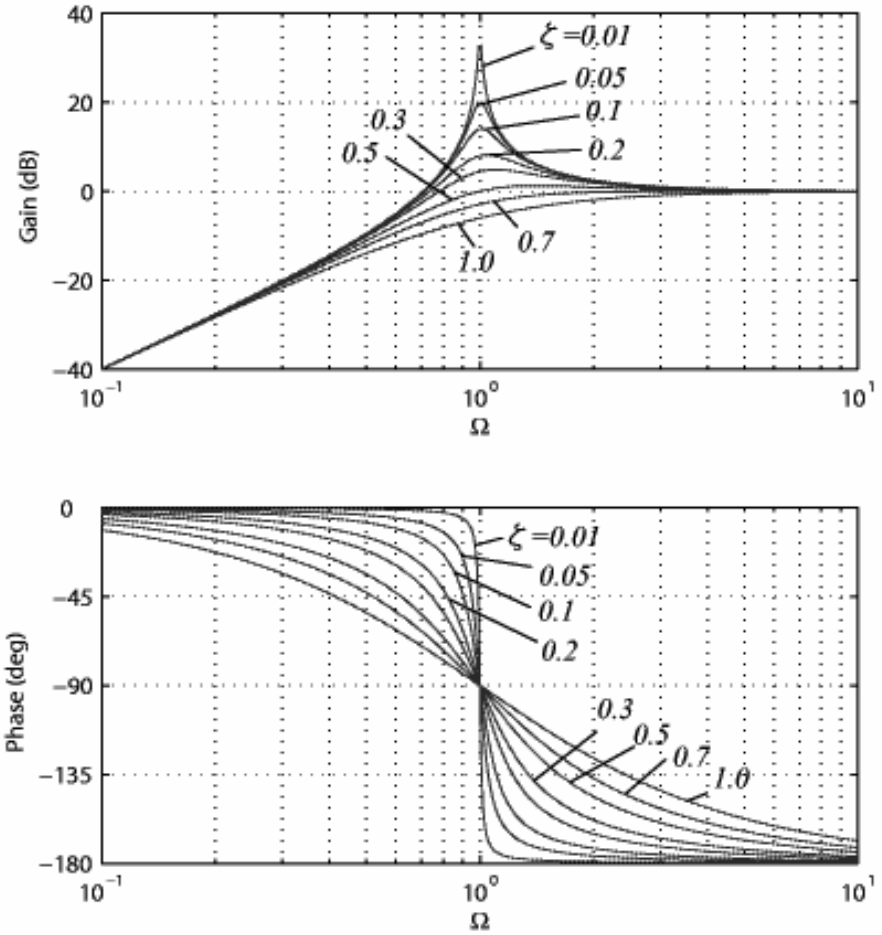

Fig.4 Frequency response function of $\frac{Z(i\omega)}{Y}$