Mechanical Vibration Ⅰ (10)

Department of Mechanical and Control Engineering

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Complex Base Excitation

Frequency response function for base excitation (1)

Base excitation

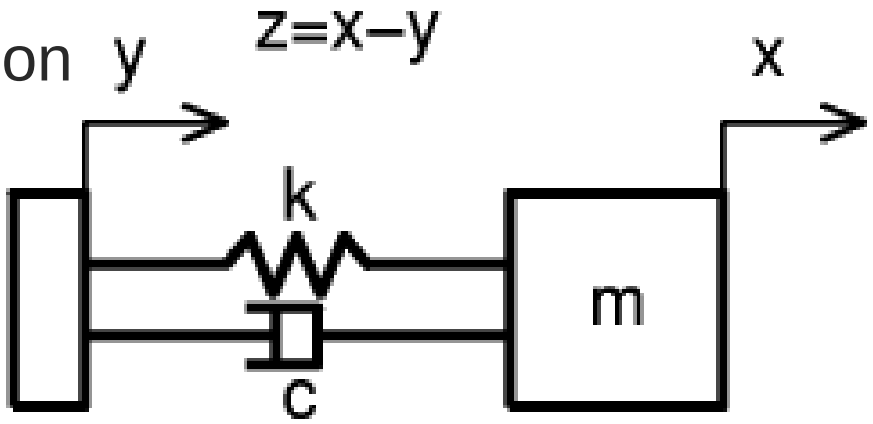

Fig.2 One degree-of-freedom vibration system with base excitation

Absolute displacement *x*

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

Relative displacement *z*

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

Frequency response function for base excitation (2)

Absolute displacement *x*

$$\frac{X(i\omega)}{Y} = \frac{k + ic\omega}{(k - m\omega^2) + ic\omega}$$

$$= \frac{1 + i2\zeta\Omega}{(1 - \Omega^2) + i2\zeta\Omega}$$

Frequency response function for base excitation (3)

Absolute displacement *x*

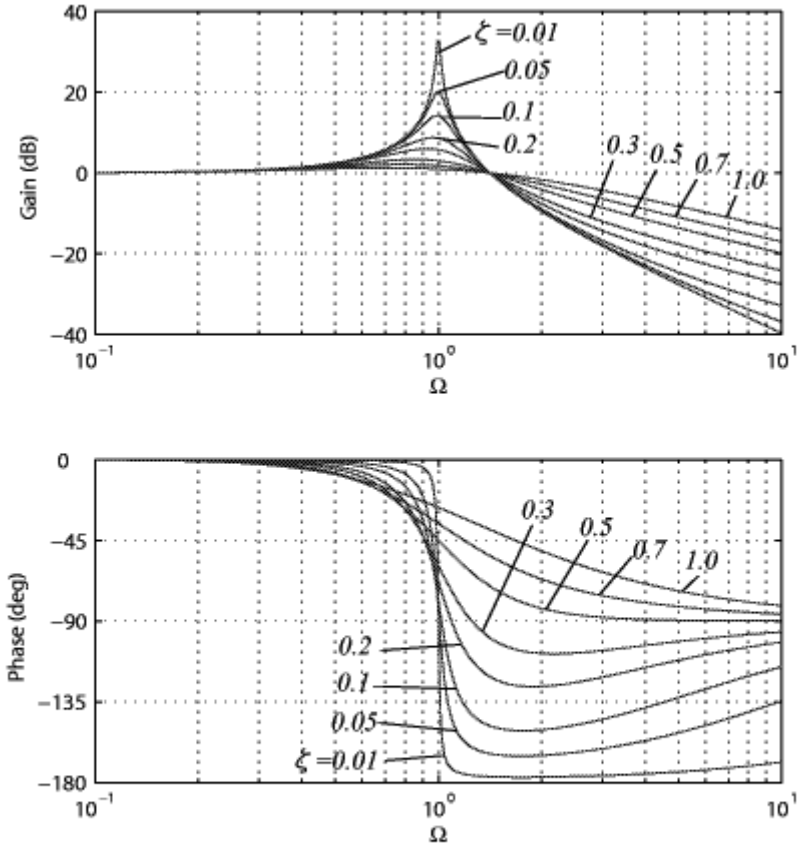

Fig.3 Frequency response function of $\frac{X(i\omega)}{Y}$

Frequency response function for base excitation (4)

Relative displacement *z*

$$\frac{Z(i\omega)}{Y} = \frac{m\omega^2}{(k - m\omega^2) + ic\omega}$$

$$= \frac{\Omega^2}{(1 - \Omega^2) + i2\zeta\Omega}$$

Frequency response function for base excitation (5)

Relative displacement z

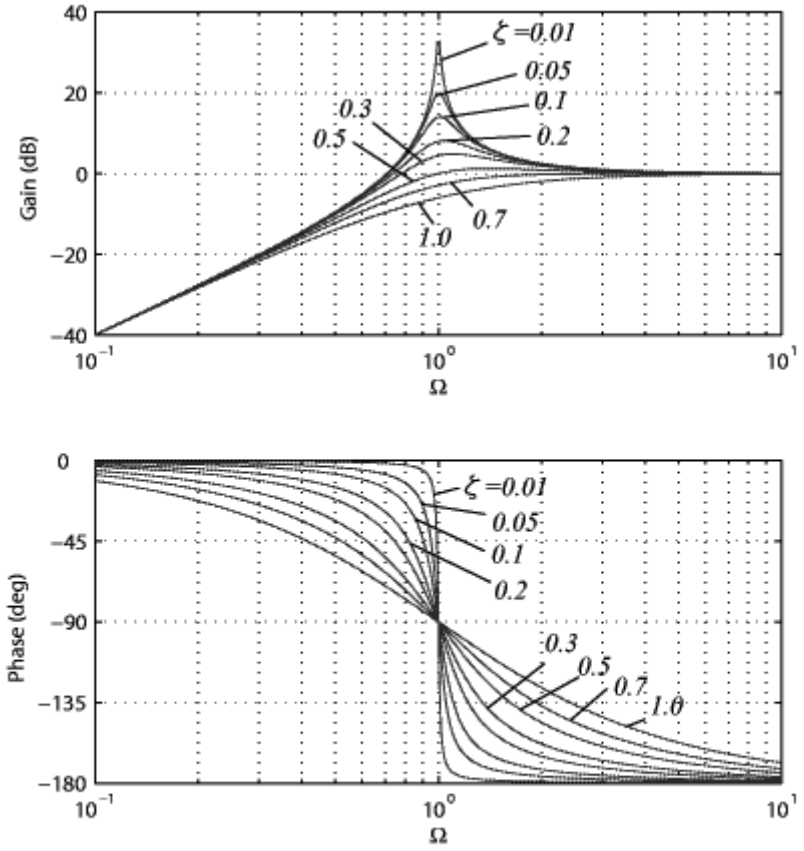

Fig.4 Frequency response function of $\frac{Z(i\omega)}{Y}$