Unit - 2

Free Damped Vibration and forced Damped Vibration

Damping is the resistance offered by a body to the motion of a vibratory system. The resistance may be applied by a liquid or solid internally or externally.

The main advantage of providing damping in mechanical system is just to control the amplitude of vibration so that the failure occuring because of resonance may be avoided.

2 marks

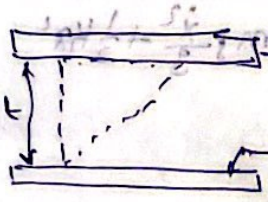
Types of Damping.

1. Viscous damping
2. Coulomb damping
3. Structural damping
4. non-linear, slip or interfacial damping.

2 marks

Viscous Damping:

When the system is allowed to vibrate in a viscous medium, the damping is called as viscous. Viscosity is the property of a fluid by virtue of which it offers resistance to the motion of one layer over the adjacent one.



$$F = \frac{\mu A}{t} \dot{x}$$

A = area of the plate

t = thickness of the fluid film

μ = Coefficient of absolute viscosity of the film.

$F = C\dot{x}$

$C = \frac{\mu A}{t}$

Eddy Current Damping:-

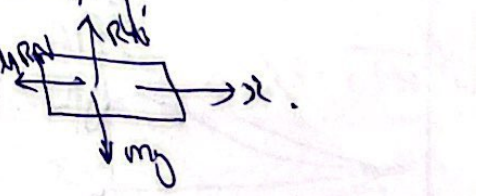
Damping is based on the principle of generation of eddy current which provides the damping. If a non-ferrous conducting object is moved in a direction perpendicular to the line of magnetic flux which is produced by a permanent magn then as the object moves, current is induced in the object. The current is proportional to the velocity of the object assumi that the magnetic flux and the dimensions of the body remain constant.

Coulomb Damping:-

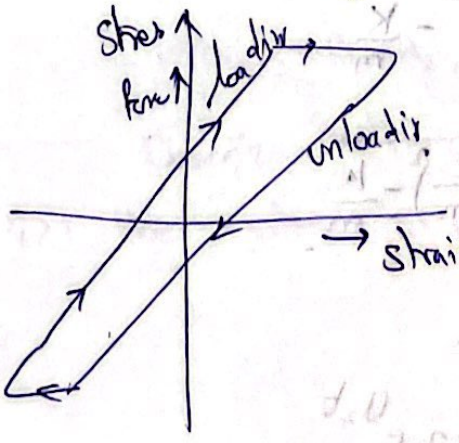
When one body is allowed to slide over th other the surface of one body often resistance to the movement of the other body onit. This resisting force is called force of friction. Thus force of friction arises only because of relative movement dry between the two surface.

Dry friction or coulomb damping

$F = \mu R_N$



Structural Damping:-



Strain Energy.

$E = \pi A^2$