MODULE 4

MECHANICAL SPRINGS

INTRODUCTION

A spring is a resilient member capable of providing large elastic deformation. A spring is basically defined as an elastic body whose function is to distort when loaded and to recover its original shape when the load is removed. Mechanical springs are used in machines and other applications mainly

- *to exert force,*
- *to provide flexibility*
- *to store or absorb energy.*

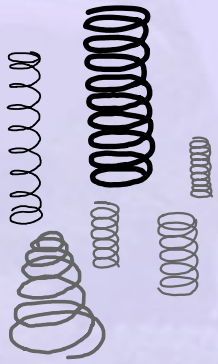
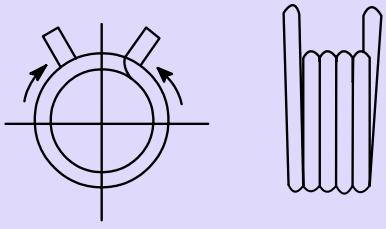


Figure 4.1

In general, springs may be classified as either wire springs, flat springs, or special-shaped springs, and there are variations within these divisions. Wire springs include helical springs of round or square wire that are cylindrical or conical in shape and are made to resist tensile, compressive, or torsional loads.



Torsion springs. Twist round or rectangular wire

Figure 4.3

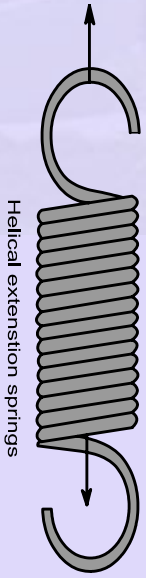


Figure 4.2

Under flat springs are included the cantilever and elliptical type (leaf) springs, the wound motor-or clock type power springs and the flat spring washers, usually called Belleville springs.

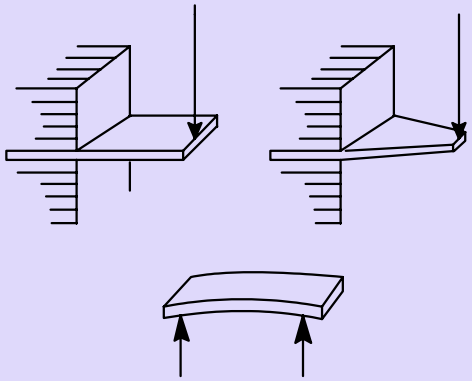
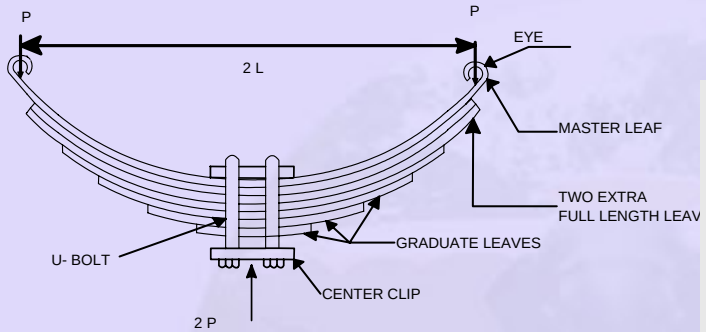


Figure 4.4



Semi-elliptic leaf spring

Figure 4.6

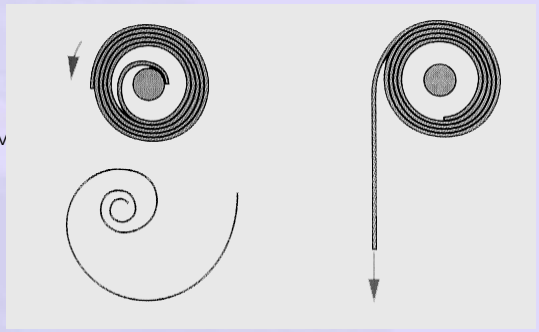
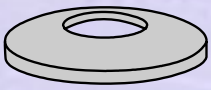


Figure 4.5



Belleville

Figure 4.7

COIL SPRINGS

Among the various springs helical or coil compression springs are the widely used ones and hence discussions will be confined to the helical (coil) compression springs The basic nomenclature of this springs are illustrated below.

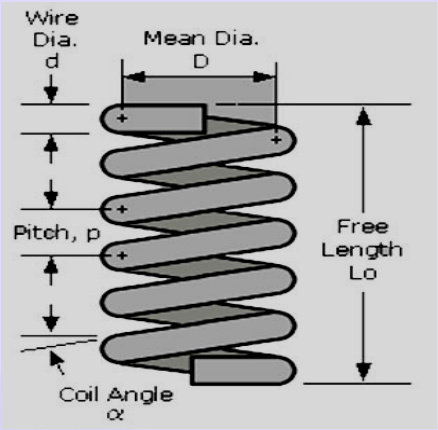


Figure 4.8

Nomenclature

A Material constant

C Spring index=D/d

d Wire diameter

D Mean coil diameter

f Natural frequency of the spring

F Force/Load

G Shear Modulus (of Rigidity)

J Polar Moment of Inertia

k Spring rate or spring stiffness

K Stress correction factor

L Length

N Number of coils

T Torsional Moment

U Strain energy

Helix angle

y Deflection

γ Density

τ Shear stress in spring

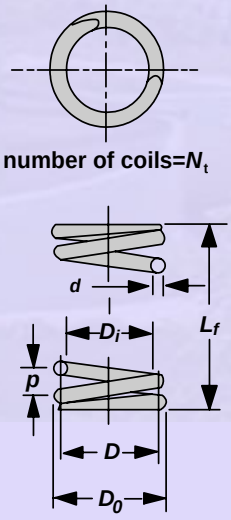


Figure 4.9