# Design of Springs

→ It is defined as elastic (or) resilent body whose function is to deflect on deform when load is applied and recover is original Position when load is removed.

To apply force → Spring in clutches, brakes
Spring loaded valves.

Types → Helical spring
Leaf Spring
Torsional Spring.

## Design of helical Compression Spring:

(1) Design a helical Compression Spring made of oil harden & temperd steel Carrying a maximum Static load of 1000 N. max deflection is 25mm. The ultimate shear stress and modulus of rigidity of Springs are 420 N/mm² & 84 kN/mm² res. Spring index 5. Det wire diameter, mean coil diameter. Total no of Coils & active coils, free length, Solid length & Pitch

Gn :

$P = 1000\ N$

$G = 84 \times 10^3\ N/mm^2$

$\tau = 420\ N/mm^2$

$C = 5$

$\delta_{max} = 25\ mm$

Soln : $\Rightarrow$ Stiffness (q) = $\dfrac{P_{max}}{\delta_{max}} = \dfrac{1000}{25}$

$q = 40\ N/mm$

PSG DB $\Rightarrow$ P.No 7.100

Wahl's stress factor

$$k_s = \frac{4C-1}{4C-4} + \frac{0.615}{C}$$

$$= \frac{19}{16} + \frac{0.615}{5}$$

$k_s = 1.3105$

$$\tau = \frac{8PC}{\pi d^2} k_s$$

$$420 = \frac{8 \times 1000 \times 5 \times 1.3105}{\pi d^2}$$

$d = 7mm$

$C = D/d$

$D = 35mm$

$$q = \frac{Gd}{8c^3 n} \Rightarrow n = \frac{Gd}{q\, 8c^3}$$

$$= \frac{84 \times 10^3 \times 7}{40 \times 8 \times 5^3}$$

$$\boxed{n = 15} \Rightarrow (= n')$$

Other Parameters :-

$L_g = d \times n = \boxed{L_g = 105\,mm}$ → deflection

$l_f = l_g + y + (n' - 1) \times$ gap b/w two coils

$= 105 + 25 + (14) \times 1$

$$\boxed{l_f = 144\,mm}$$

$l_f = p \times n \Rightarrow \boxed{P = 9.6\,mm}$

$$\frac{l_f}{D} < 3 \Rightarrow \frac{144}{35} = 4.114$$

$$\boxed{D = 50\,mm}$$

x ———— x ———— x ———— x ———— x