Problem of Practices
on
Mechanical Engineering Design
Chapter-7 Mechanical Springs

Prepared By

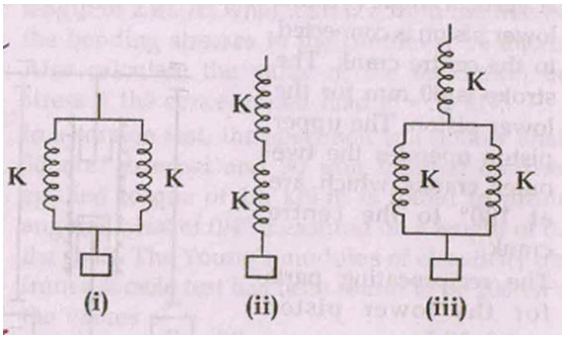
Brij Bhooshan
Asst. Professor
B. S. A. College of Engg. And Technology
Mathura, Uttar Pradesh, (India)

Supported By:
Purvi Bhooshan

Please welcome for any correction or misprint in the entire manuscript and your valuable suggestions kindly mail us *brijrbedu@gmail.com* or *brijbhooshanin@gmail.com*.

1. A vertical spring loaded valve is required for a compressed air receiver. The valve is to start opening at a pressure of 100 N/cm^2 gauge and must be fully open with a lift of 0.4 cm at a pressure of 120 N/cm^2 gauge. Diameter of port is 2.5 cm. Assume the following:
   Allowable shear stress in spring steel = 480 N/mm^2
   Modulus of rigidly for spring steel = 8×10^6 N/cm^2
   Spring index (C) = 6
   and calculate Ward's factor (K) by the following formula
   $$K = \frac{4C-1}{4C-4} + \frac{0.616}{C}$$
   Design a suitable close coiled round section helical spring having squared ground ends. Also specify initial compression and free length of the spring.
2. Design a suitable helical spring for a balance which is used to measure 0 to 100 kg over a scale of 80 mm. The spring is to be enclosed in a casing of 25 mm diameter. Approximate number of turns is 30. Also calculate the maximum shear stress induced. $G = 0.85 \times 10^7$ N/cm^2.

3. Find the equivalent spring constant if the below shown spring systems are replaced by a single spring.



4. Design a close coiled helical spring to have spring index of 8. Axial deflection in spring is not to exceed 100 mm under an axial load of 2600 N and shear stress developed in spring is not to exceed 300 N/mm^2. Steel wires are available in diameters of 10, 11, 12, 13, 14 mm (in steps of 1 mm). Determine most suitable wire diameter, mean coil diameter and number of coils in spring. Given G = 84000 N/mm^2.