**BBDNITM**

**MECHANICAL ENGG. DEPARTMENT**

**SESSION (2018-19)**

**Subject- Mechanics of Solids [RME303]**

**Assignment – 3**

1. Distinguish between closed coil helical spring and open coil helical spring.
2. Write down the equation for Wahl factor.
3. How will you find maximum shear stress induced in the wire of a close-coiled helical spring carrying an axial load?
4. Write the expressions for stiffness of a close coiled helical spring.
5. What is crippling load? Give the effective length of columns when both ends hinged and when both ends fixed.
6. Find the critical load of an Euler’s column having 4 m length, 50 mm x 100 mm cross section and hinged at both the ends E = 200 kn/mm2.
7. What are the different modes of failures of a column?
8. Write down the Rankine formula for columns.
9. What is effective or equivalent length of column?
10. Define Slenderness Ratio.
11. Define the terms column and strut.
12. State the limitations of Euler’s formula.
13. A 1.2 m long column has a circular cross section of 45 mm diameter one of the ends of the column is fixed in direction and position and other ends is free. Taking factor of safety as 3, calculate the safe load using:
    1. Rankine's formula, take yield stress = 560 N/mm2 and *a =* 1/1600 for pinned ends.
    2. Euler's formula, Young's modulus for cast iron = 1.2 x 105 N/mm2
14. Find the Euler critical load for a hollow cylindrical cast iron column 150 mm external diameter, 20 mm wall thickness if it is 6 m long with hinged at both ends. Assume. Young's modulus of cast iron as 80 kN/mm2. Compare this load with that given by Rankine formula. Using Rankine constants a =1/1600 and 567 N/mm2
15. Determine the section of a hollow C.I. cylindrical column 5 m long with ends firmly built in. The column has to carry an axial compressive load of 588.6 KN. The internal diameter of the column is 0.75 times the external diameter. Use Rankine’s constants.

a= 1 / 1600, σc = 57.58 KN/cm2 and F.O.S = 6.

1. The stiffness of the closed coil helical spring at mean diameter 20 cm is made of 3 cm diameter rod and has 16 turns. A weight of 3 KN is dropped on this spring. Find the height by which the weight should be dropped before striking the spring so that the spring may be compressed by 18 cm. Take C= 8x104 N/mm2
2. It is required to design a closed coiled helical spring which shall deflect 1mm under an axial load of 100 N at a shear stress of 90 Mpa. The spring is to be made of round wire having shear modulus of 0.8 x 105 Mpa. The mean diameter of the coil is 10 times that of the coil wire. Find the diameter and length of the wire.
3. The stiffness of close coiled helical spring is 1.5 N/mm of compression under a maximum load of 60 N. The maximum shear stress in the wire of the spring is 125 N/mm2.The solid length of the spring (when the coils are touching) is 50 mm. Find the diameter of coil, diameter of wire and number of coils. C = 4.5.
4. A helical spring of circular cross-section wire 18 mm in diameter is loaded by a force of 500 N. The mean coil diameter of the spring is 125mm. The modulus of rigidity is 80 kN/mm2. Determine the maximum shear stress in the material of the spring. What number of coils must the spring have for its deflection to be 6 mm?