# ASSIGNMENT: MECHANICAL PROPERTIES OF SOLIDS

1. **What is an elastomer? Give an example for the same.**
2. **Distinguish between elasticity and plasticity of materials.**
3. **Two wires of same length and material, but of different radii are suspended from a rigid support. Both carry the same load; will the stress, strain and extension in them be same or different?**
4. **Give the SI unit of stress, strain and modulus of elasticity.**
5. **A heavy wire is suspended from a roof, but no weight is attached on its other end. Is it under stress? Justify.**
6. **Two wires of the same material have lengths in the ratio 1:2 and radii in the ratio 2:1.When they are stretched by the same force, what is the ratio of elongation produced in them?**
7. **A wire suspended vertically from one of its ends is stretched by attaching a weight of 200 N to the lower end. The weight stretches the wire by 1 mm. What is the elastic energy stored in the wire ?**
8. **Some work has to be done in stretching a wire. Where is the energy stored?**
9. **Which is more elastic, steel or rubber ? Justify.**
10. **What are the factors on which modulus of elasticity of a material depend?**
11. **An elastic wire is cut into half. How would it affect the maximum load that the wire can support?**
12. **What force is required to stretch a copper wire 1cm2 in cross section to double its length? (Y of copper = 120Gpa)**
13. **Find stress, strain and Young’s modulus of elasticity in the case of a wire 1.5m long and 1mm2 in cross section, if it is increased by 1.55 mm in length, when a mass of 10kg is suspended from it.**
14. **Two parallel steel wires A and B are fixed to rigid support at the upper ends and subjected to the same load at the lower ends. The lengths of the wires are in the ratio 4:5 and their radii are in the ratio 4:3. The increase in length of the wire A is 1mm.Find the increase in length of the wire B.**
15. **When the pressure on a sphere is increased by 80 atmospheres, its volume decreases by 0.01%. Find the bulk modulus of elasticity if the material of the sphere.**
16. **The length if a wire is l1, when the tension is T1; and is l2 when the tension is T2.Find the original length of the wire.**
17. **When a weight W is hung from one end of a wire of length L, the extension is l. If the wire is passes over pulley and two weights W each are hung at the two ends, what is the total elongation of the wire?**
18. **When a metallic cube is subjected to a stress of 6x109 Nm-2, each side of the cube gets shortened by 1%. Find the volume strain and bulk modulus of the metal.**
19. **Define the terms a) Young’s modulus of elasticity b) yield strength c) tensile strength.**
20. **A mass of 5 kg is hung from a copper wire of 1mm diameter and 2m in length. Calculate the extension produced. What should be the minimum diameter of the wire, so that its elastic limit is not exceeded?**
21. **A spring of spring constant 5 × 103 N** / **m is stretched initially by 5 cm from the un-stretched position. The work required to stretch it further by another 5 cm is**

**( a ) 6.25 Nm ( b ) 12.50 Nm ( c ) 18.75 Nm ( d ) 25.00 Nm [ AIEEE 2003 ]**

1. **If ‘S’ is stress and ‘Y’ is Young’s modulus of material of a wire, the energy stored in the wire per unit volume is**

**( a ) S2** /**( 2Y ) ( b ) 2S2Y ( c ) S**/**2Y ( d ) 2Y** /**S2 [ AIEEE 2005 ]**

1. **Find the maximum length of a steel wire that can be hung vertically without breaking. Breaking stress of steel = 7.9 x 109 dyne cm-2 .Density of steel = 2gcm-3 (Ans: 104 m)**
2. **A solid ball of radius 3 cm is immersed in a lake at a depth so that the pressure exerted by water is 106 dyne cm-2. Find the decrease in the volume of the ball. Bulk modulus of the material of the ball = 1 x 107 dyne cm-2  (Ans: 11.3 cm3 )**

1. **If the normal density of sea water is 103 kgm-3, what will be its density at a depth of 3 km. Take g = 10 ms-2. Compressibility of sea water = 5 x 10-5 atm -1 (1 atm. = 105 Nm-2)(Ans: 1.015 x 103 kgm-3)**
2. **Compute the bulk modulus of water from the following data: Initial volume = 100 litre, Pressure increase = 100 atm., final volume = 100.5 litre. (Ans: 2.026 x 109 Pa)**
3. **A wire of length L and cross sectional area A is kept on a horizontal surface and one of its end is fixed at the point to O. A ball of mass m is tied to its other end and the ball is rotated horizontally with angular speed ω. Show that the increase in the length of the wire is** $∆l= \frac{mL^{2} ω^{2}}{A Y}$
4. **A wire of radius r stretched without strain along a straight line is lightly fixed at A and B (AB = L). What is the tension when it is pulled into the shape ACB? Young’s modulus is Y. (NC = y)** $ Ans : T =F \sqrt{\frac{(4Y^{2}+L^{2})}{4y}}$

  **N**

 **A B**

 **y**

 **C**

 **F**