Assignment-1   Mechanical Properties of Materials

1)   Define: Force , Line of Action, Strength of materials

2)   What is load? Explain.

3)   Write short note on stress and types of stress.

4)   What is strain? Explain in detail.

5)   What is stress concentration?

6)   Explain Hooke's law.

7)   What is tensile test? Explain Stress-Strain curve.

8)   Explain types of stress based on tensile test.

9)   Write short note on Poisson's ratio.

10)   Write short note on Factor of safety and working stress.

11)   Write short note on (i) Ductility   (ii) Brittleness (iii) Plasticity.

12)   What is elasticity? Explain different types of it.

13)   Establish relation between Young's modulus (E) and Modulus of rigidity (G).

14)   Establish relation between E, G and K.

15)   Derive Torsional Formula for a twisting Shaft.

16)   Derive formula for Young's modulus of a cantilever.

17)   Write short note on I-shape girders.

18)   Write short note on Viscosity and explain temperature effect on viscosities.

19)   What are the types of fluids? Explain.

Numerical:

1. When an iron wire of 1m length and radius of 0.1 mm elongates by 0.32mm stretched by a force of 49 N. calculate elastic constant of iron wire. [ans: 4.8×10^{10} N/m^2]

2. A load of 2 kg produces an extension of 1 mm in a wire of 3m and 1mm in diameter. Calculate Young's modulus of a wire.   [ans: 7.48×10^{10} N/m^2]

3. What force is required to stretch a steel wire to double the length when its area of cross section is 1 cm^2? Young's modulus of wire is 7 x 10^{10} N/m^2. [ans: 7 x 10^6 N/m^2]

4. Calculate rigidity Modulus and Poisson's ratio for a metal of Y= 7.25 x 10^{10} N/m^2 and K=11x 10^{10} N/m^2.   [ans: G=2.67 x 10^{10} N/m^2 , ratio=0.391]

5. A metal disk of 0.1 m radius and mass 1 kg is suspended in a horizontal plane by a vertical wire attached to its center. If diameter of wire is 10^{-3} m , its length 1m and period of torsional vibration is 4 second, find the Rigidity modulus of wire. [1.256x 10^{11} N/m^2]

6. A body suspended symmetrically from the lower end of the wire 1m long, 1.22x 10^{-3} meter in diameter, oscillates about the wire as the axis with a period of 1.25 s. if the modulus of rigidity of material of wire is 8 x 10^{10} N/m^2, calculate the moment of inertia of the body about the axis. [I=6.885 x 10^{-4} kgm^2]

7. What force must be applied to a wire of 1m long, 10^{-3} m in diameter in order to twist one end of it through 90°, the other end remaining fixed? The rigidity of the material of the wire is 2.8 x 10^{10} N/m^2. [4.318 x 10^{-3} Nm]

8. One end of wire of 4 mm radius and 100 cm in length is twisted through 60°. calculate the angle of shear on its surface. [ans: theta= 0.24^o]

9. The end of cantilever depressed 10mm under certain load. Calculate depression under same load of another cantilever of double dimension in length and width 3 times thickness. [ans: y'=1.48mm]

10. Determine the young's modulus of a uniform bending rod by a distance of 0.6m and loads of 2.5 kg are hanging at 0.18 m away from knife edge. The breadth and thickness of rod are 0.025m and 0.005m respectively. Elevation is 0.007m. [ans: Y=1.088x10^{10}N/m^2].