CHAPTER 9 : -

MECHANICAL PROPERTIES OF SOLIDS

I. One mark questions (PART – A):

1. What is elasticity of a body?(U)
2. What is plasticity? (K)
3. Give one example for plastic substance. (K)
4. Define stress. (U)
5. Write the S.I unit of the stress. (K)
6. Define strain. (K)
7. Define longitudinal strain. (U)
8. Define volume strain. (U)
9. Define shearing strain. (U)
10. Define elastic limit. (yield strength.) (U)
11. Define ultimate tensile strength. (U)
12. What are elastomers? (U)
13. Give one example for elastomers. (K)
14. Define modulus of elasticity. (U)
15. Define Young`s modulus. (U)
16. Write the expression for magnitude of the Young`s modulus. (K)
17. What is the S.I unit of the Young`s modulus? (K)
18. Write the dimensional formula of the Young`s modulus. (K)
19. Why steel is preferred in heavy duty machines and in structural design? (U)
20. Why springs are manufactured in steel instead of copper? (U)
21. Define shear modulus or modulus of rigidity. (U)
22. Define bulk modulus. (U)
23. What is compressibility? (K)
24. Why steel is more elastic than that of rubber? (A)
25. What is the buckling of the material of the road? (U)
26. Why pillars or columns of the bridges and buildings have distributed shape at their ends? (A)
27. Why liquid and gas do not posses modulus of rigidity? (A)
28. Write the S.I for the compressibility. (K)

II. Two mark questions (PART – B):

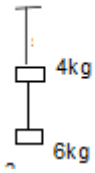
1. State and explain Hooke's law. (U)
2. Write the expression for Young`s modulus of the material of the wire under stretching. Explain the terms. (U)
3. Write the expression for rigidity modulus of the material. Explain the terms. (U)
4. Write the expression for bulk modulus of the material. Explain the terms. (U)
5. A square lead slab of side 50cm and thickness 10cm subjected to shearing force of $9X10^{4}$N.Calculate the shearing stress acting on the slab. (A)
6. Write two application of elastic behavior of the material. (K)
7. A steel rod of area of cross section $3.14x10^{-4}m^{2}$ is stretched by a force of 100kN. Calculate the stress acting on the rod(A)
8. Compute the fractional change in the volume of glass sphere when subjected to a hydraulic pressure of $1.013x10^{6}Nm^{-2}$. Given bulk modulus of glass is $3.7x10^{10}$ Nm^{-2}(U)

III. Three mark questions (PART – C):

1. Draw typical stress – strain graph for a material and represent Yield point, elastic limit and fracture point. (S)

Five mark questions (PART – D):

1. A steel rod of radius 10mm and length 2m is stretched by a force of 100kN along its length. The elongation in the wire is 3.2mm. Find the stress and Young's modulus of the material of the rod.
2. The upper face of a cube of edge 1m moves through a distance of 1mm relative to the lower fixed surface under action of a tangential force 1.5×10^{8}N. Calculate tangential stress and rigidity modulus.
3. When a rubber ball is taken in deep of 100m in sea its volume is decrease by 0.1% due to hydraulic stress. If the density of sea water is 1000kgm^{-3}, calculate the bulk modulus and compressibility of the rubber
4. A steel wire of length 5m and cross section 3×10^{-5}m^{2} stretched by the same amount as copper of length 3.7m and cross section 4×10^{-5}m^{2} under given load. Find the ratio of Young's modulus of steel to that of copper
5. Two wires of area of cross section 5×10^{-6}m^{2}, one made of steel and the other made of brass are loaded as shown. The unloaded steel wire of length 1.5m that of brass wire is 1m. Find the elongations in each wires. Y for steel is2×10^{11} Nm^{-2} and for brass is0.91×10^{11}Nm^{-2}



6. Find the force required to stretch a wire of area of cross section 2×10^{-4} m^{2} so that its length becomes 1.5 times original length . Young's modulus=3.6×10^{11}Nm^{-2}.