CHAPTER-7 | Mechanical Properties of Solids

QUIZ PART-02

1. The ratio of stress to strain within the limit of elasticity is called:
   A. Poisson's ratio B. Elastic modulus
   C. Bulk stress D. Shear strain (B)

Explanation : Stress/strain = modulus of elasticity. It represents how strongly a material resists deformation within its elastic limit.

2. The slope of the stress–strain curve in the elastic region represents:
   A. Poisson's ratio B. Bulk modulus
   C. Elastic modulus
   D. Shear modulus (C)

Explanation : In the elastic region, stress ∝ strain. The slope (stress/strain) is the modulus of elasticity.

3. Which physical quantity has the dimensions $[M^1L^{-1}T^{-2}]$?
   A. Force B. Pressure
   C. Power D. Work (B)

Explanation : The modulus of elasticity has the same dimensions as pressure, i.e., $[M^1L^{-1}T^{-2}]$.

4. Young's modulus of elasticity is defined as the ratio of:
   A. Volume stress to volume strain
   B. Shearing stress to shearing strain
   C. Longitudinal stress to longitudinal strain
   D. Lateral strain to longitudinal strain (C)

Explanation : Y = (F/A) ÷ (ΔL/L). It applies to stretching or compressing a wire/rod.

5. If the radius of a cylindrical wire decreases when stretched, the ratio of lateral strain to longitudinal strain is called:
   A. Bulk modulus B. Shear modulus
   C. Poisson's ratio
   D. Elastic modulus (C)

Explanation : σ = lateral strain / longitudinal strain. Negative sign indicates reduction in radius when length increases.

6. The reciprocal of bulk modulus (K) is called:
   A. Flexibility B. Plasticity
   C. Compressibility D. Rigidity (C)

Explanation : β = 1/K, representing how much a material reduces its volume under pressure.

7. Which of the following is true for gases?
   A. They possess only shear elasticity
   B. They possess only bulk elasticity
   C. They possess both shear and bulk elasticity
   D. They possess neither shear nor bulk elasticity (B)

Explanation : Gases change volume under pressure but cannot resist shear stress.

8. The relation $Y = 2\eta(1+\sigma)$ connects:
   A. Young's modulus, Bulk modulus, and Poisson's ratio
   B. Young's modulus, Shear modulus, and Poisson's ratio
   C. Bulk modulus, Shear modulus, and Stress
   D. Stress, Strain, and Poisson's ratio (B)

Explanation : This formula shows how shear modulus and Poisson's ratio determine Young's modulus.

9. If the stress applied to a wire of unit cross-sectional area doubles its length, the stress numerically equals:
   A. Young's modulus
   B. Twice Young's modulus
   C. Half Young's modulus
   D. Four times Young's modulus (A)

Explanation : By definition, Young's modulus is that stress which doubles the length of a wire with unit cross-section.

10. For any material, the practical value of Poisson's ratio (σ) is:
    A. Greater than 1 B. Less than 0.5
    C. Exactly 0.5 D. Negative (B)

Explanation : In practice, σ is always < 0.5. At σ = 0.5, the volume would remain unchanged, which is not realistic.