

Q1. Given that for an element in a body of homogeneous isotropic material subjected to

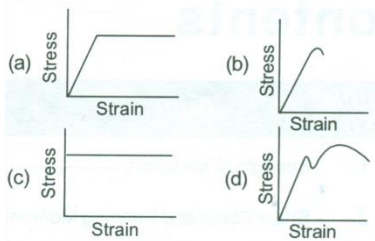
Plane stress; ϵ_x , ϵ_y and ϵ_z are normal strains in x , y , z directions respectively and μ is the Poisson's ratio, the magnitude of unit volume change of the element is given by

- $\epsilon_x + \epsilon_y + \epsilon_z$
- $\epsilon_x - \mu (\epsilon_y + \epsilon_z)$
- $\mu (\epsilon_x + \epsilon_y + \epsilon_z)$
- $1/\epsilon_x + 1/\epsilon_y + 1/\epsilon_z$

Q2. A solid metal bar of uniform diameter D and length L is vertically from a ceiling. If the density of the material of the bar is ρ and the modulus of elasticity is E , then the total elongation of the bar due to its own weight is

- $\rho L / 2E$
- $\rho L^2 / 2E$
- $\rho E / 2L$
- $\frac{\rho E}{2L^2}$

Q3. The stress-strain curve for an ideally plastic material is



Q4. A steel cube of volume 8000 cc is subjected to an all round stress of 1330 kg/sq. cm. The bulk modulus of the material is 1.33×10^6 kg/sq.cm. the volumetric change is

- 8 cc
- 6 cc
- 0.8 cc
- 10^{-3} cc

Q5. In terms of bulk modulus (K) and modulus of rigidity (G), the poisson's ratio can be expressed

- $(3K - 4G) / (6K + 4G)$
- $(3K + 4G) / (6K - 4G)$
- $(3K - 2G) / (6K + 2G)$
- $(3K + 2G) / (6K - 4G)$

Q6. Two bars one of material A and the other of material B of same length are tightly secured between two unyielding walls. Coefficient of thermal expansion of bar A is more than that of B. When temperature rises the stresses induced are

- Tension in both material
- Tension in material A and compression in material B
- Compression in material A and tension in material B
- Compression in both materials

Q7. A bar of diameter 30 mm is subjected to a tensile load such that the measured extension on a gauge length of 200 mm is 0.09 mm and the change in diameter is 0.0045 mm. the Poisson's ratio will be

- 1/4
- 1/3
- 1/4.5
- 1/2

Q8. When a mild-steel specimen fails in a torsion test, the fracture looks like



Q9. A 2 m long bar of uniform section 50 mm² extends 2 mm under a limiting axial stress of 200 N/mm². what is the modulus of resilience for the bar ?

- 0.10 units
- 0.20 units
- 10000 units
- 200000 units

Q10. The stress level, below which a material has a high probability of not failing under reversal of stress, is known as

- Elastic limit
- Endurance limit
- Proportional limit
- Tolerance limit

Q11. The length given below refer to a bar of length L , cross sectional area A , Young's modulus E , Poisson's ratio μ and subjected to axial stress ' p '. Match List-I with List II and select the correct answer using the codes given below the lists :

List - I	List -II
A. Volumetric strain	1. $2(1 + \mu)$
B. Strain energy per unit volume	2. $3(1 - 2\mu)$
C. Ratio of Young's modulus to bulk modulus	3. $\frac{P}{E} (1 - 2\mu)$
D. Ratio of Young's modulus to modulus rigidity	4. $\frac{P^2}{2E}$
	5. $2(1 - \mu)$

Codes :

- A-3, B-4, C-2, D-1
- A-5, B-4, C-1, D-2
- A-5, B-4, C-2, D-1
- A-2, B-3, C-1, D-5

Q12. If all dimensions of prismatic bar of square cross-section suspended freely from the ceiling of a roof are doubled then the total elongation produced by its own weight will increase

- Eight times
- Four times
- Three times
- Two times

Q13. The stress at which a material fractures under large number of reversal of stress is called.

- Endurance limit
- Creep
- Ultimate strength
- Residual stress

Q14. A round steel bar of overall length 40 cm consists of two equal portions of 20 cm each having diameter of 10 cm and 8 cm respectively. if the rod is subjected to a tensile load of 10 tonnes, the elongation will be given by

$$(E = 2 \times 10^5 \text{ kg/cm}^2)$$

- $\frac{1}{10\pi} \left(\frac{1}{25} + \frac{1}{16} \right) \text{cm}$
- $\frac{2}{10\pi} \left(\frac{1}{25} + \frac{1}{16} \right) \text{cm}$
- $\frac{3}{10\pi} \left(\frac{1}{25} + \frac{1}{16} \right) \text{cm}$
- $\frac{4}{10\pi} \left(\frac{1}{25} + \frac{1}{16} \right) \text{cm}$

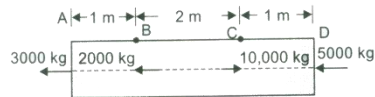
Q15. A copper bar of 25 cm length is fixed by means of supports at its ends. Supports can yield (total) by 0.01 cm. If the temperature of the bar is raised by 100°C, then the stress in the bar for $\alpha_c = 20 \times 10^{-6} / ^\circ\text{C}$ & $E_c = 1 \times 10^6 \text{ kg/cm}^2$ will be

- a. $2 \times 10^2 \text{ kg/cm}^2$
- b. $4 \times 10^2 \text{ kg/cm}^2$
- c. $8 \times 10^2 \text{ kg/cm}^2$
- d. $16 \times 10^2 \text{ kg/cm}^2$

Q16. A given material has Young's modulus E, modulus of rigidity G and Poisson's ratio 0.25 the ratio of Young's modulus to modulus of rigidity if this material is

- a. 3.75
- b. 3
- c. 2.5
- d. 1.5

Q17. A prismatic bar of uniform cross-sectional area of 5 cm² is subjected to axial loads as shown in the given figure.



Portion BC is subjected to an axial stress of

- a. 400 kg/cm² tension
- b. 2000 kg/cm² compression
- c. 1000 kg/cm² tension
- d. 600 kg/cm² tension

Q18. If 'A' be the area of cross-section of a bar, the gauge length for the measurement of ductility will be

- a. $5.65 \times A^{1/2}$
- b. $5.65 \times A$
- c. $5.56 \times A^{1/2}$
- d. $6.56 \times A$

Q19. Match List-I with List-II and select the correct answer

List-I	List-II
A. Ductility	1. Failure without warning
B. Brittleness	2. Drawn permanently over great changes of shape without rupture
C. Tenacity	3. Absorption of energy at high stress without rupture
D. Toughness	4. High tensile strength

Codes :

- a. A-1, B-2, C-4, D-3
- b. A-1, B-2, C-3, D-4
- c. A-2, B-3, C-4, D-1
- d. A-2, B-1, C-4, D-3