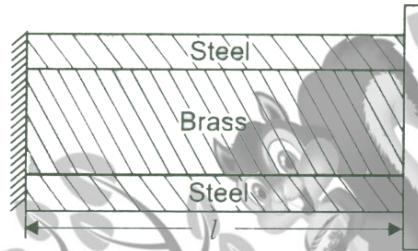


Q 1 A brass bar of solid section is encased in a steel tube shown in figure, the coefficient of expansion of steel is 11.2×10^{-6} per $^{\circ}\text{C}$ and the coefficient of expansion of brass is 16.5×10^{-6} per $^{\circ}\text{C}$. The composite bar is heated through 60°C . now consider the following statements:



1. The stress in the brass will be tensile
2. The stress in the steel will be tensile
3. The stress in the steel will be compressive
4. The stress in the brass will be compressive

Which of the statement given above are correct ?

- a. 1 and 2
- b. 1 and 3
- c. 2 and 4
- d. 2 and 3

Q 2 If the Young's modulus 'E' is equal to bulk modulus 'K' then what is the value of the poisson's ratio ?

- a. $1/4$
- b. $1/2$
- c. $1/3$
- d. $3/4$

Q 3 If G is the modulus of rigidity, E the modulus of elasticity and μ the poisson's ratio for a material, then what is the expression for G?

A. $G = \frac{3E}{2(1+2\mu)}$

B. $G = \frac{5E}{(1+\mu)}$

C. $G = \frac{E}{2(1+\mu)}$

D. $G = \frac{E}{(1+2\mu)}$

Q 4 A bar of 40 mm diameter and 400 mm length is subjected to an axial load of 100 kN. It elongates by 0.150 mm and that the diameter decreases by

0.005 mm. what is the poisson's ratio of the material of the bar?

- a. 0.25
- b. 0.28
- c. 0.33
- d. 0.37

Q5 What is the correct sequence of the following metals in the decreasing order of their poisson's ratio ?

- 1. Aluminium
- 2. Cast iron
- 3. Steel

Select the correct answer using the codes given below:

- a. 1-2-3
- b. 2-1-3
- c. 1-3-2
- d. 3-1-2

Q6 A steel rod, 100 mm long is held between two rigid supports. It is heated by 20°C . if the coefficient of thermal expansion of the material of the rod is $15 \times 10^{-6}/^{\circ}\text{C}$ and modulus of elasticity is $200 \times 10^3 \text{ mm}^2$, what is the stress in the rod ?

- 1. 20 MN/m²
- 2. 40 MN/m²
- 3. 60 MN/m²
- 4. 80 MN/m²

Q7 If modulus of elasticity of a material is 189.8 GN/m² and its poisson's ratio is 0.30, what is the approximate value of shear modulus of the material ?

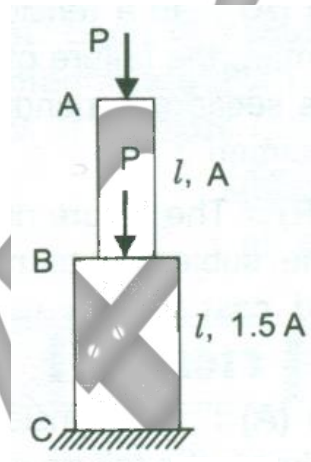
- 1. 73 GN/m²
- 2. 93.3 GN/m²
- 3. 103.9 GN/m²
- 4. 123.3 GN/m²

Q 8 The value of modulus of elasticity for a material is 200 GN/m^2 and poisson's ratio is 0.25. what is its modulus of rigidity ?

- a. 250 GN/m^2
- b. 320 GN/m^2
- c. 125 GN/m^2
- d. 80 GN/m^2

Q 9 A stepped column carries loads as shown the figure.

What is the maximum normal stress in the column at B in the larger diameter column ?



- A. $\frac{P}{1.5a}$
- B. $\frac{P}{A}$
- C. $\frac{2P}{1.5A}$
- D. $\frac{2P}{A}$

Q 10 A composite system where the components are of equal lengths is subjected to temperature rise. Which one of the following stress will be developed in the component having highest coefficient of linear expansion ?

- a. Compressive stress
- b. Tensile stress
- c. Shear stress

d. Zero stress

Q 11 Some structural members subjected to long time sustained loads deform progressively with time especially at elevated temperatures. What is such a phenomenon called ?

- a. Fatigue
- b. Creep
- c. Creep relaxation
- d. Fracture

Q 12 A compounded bar consists of material A encased in material B. it is tightly secured at the ends. The coefficient of thermal expansion of A is more than that of B. if the temperature of the bar is increased, the stresses induced will be

- a. Tensile in both material
- b. Compressive in both materials
- c. Tensile in material B and compressive in material A
- d. Compressive in material B and tensile in material A

Q 13 A circular rod of diameter 30 mm and length 200 mm is subjected to a tensile force. The extension in rod is 0.09 mm and change in diameter is 0.0045 mm. what is the poisson's ratio of the material of the rod ?

- a. 0.30
- b. 0.32
- c. 0.33
- d. 0.35

Q 14 For a material having modulus of elasticity equal to 208 Gpa and poisson's ratio equal to 0.3 what is the modulus of rigidity ?

- a. 74.0 Gpa
- b. 80.0 Gpa
- c. 100.0 Gpa
- d. 128.5 Gpa

Q 15 Given E as the bar young's modulus of elasticity of a material, what can be the minimum value of its bulk modulus of elasticity ?

- a. $E/2$
- b. $E/3$
- c. $E/4$
- d. $E/5$

Q 16 A mild steel bar rod tapers uniformly from 30 mm diameter to 12 mm diameter in a length of 300 mm. the rod is subjected to an axial load of 12 kN. $E = 2 \times 10^5 \text{ N/mm}^2$. What is the extension of the rod in mm ?

- a. $4\pi/5$
- b. $2/5\pi$
- c. $\pi/5$
- d. $1/5\pi$