STRESS - STRAIN ASSIGNMENT

1)

The state of plane-stress at a point is given by $\sigma_x = -200$ MPa, $\sigma_y = 100$ MPa and $\tau_{xy} = 100$ MPa. The maximum shear stress (in MPa) is

(A) 111.8 (B) 150.1 (C) 180.3 (D) 223.6

[GATE ME 2010]

2)

If the principal stresses in a plane stress problem are $\sigma_1 = 100$ MPa, $\sigma_2 = 40$ MPa, the magnitude of the maximum shear stress (in MPa) will be

(A) 60 (B) 50 (C) 30 (D) 20

[GATE ME 2009]

3)

A rod of length L and diameter D is subjected to a tensile load P. Which of the following is sufficient to calculate the resulting change in diameter?

(A) Young's modulus
(B) Shear modulus
(C) Poisson's ratio
(D) Both Young's modulus and shear modulus

[GATE ME 2008]

4)

A 200 x 100 x 50 mm steel block is subjected to a hydrostatic pressure of 15 MPa. The Young's modulus and Poisson's ratio of the material are 200 GPa and 0.3 respectively. The change in the volume of the block in mm^3 is

(A) 85 (B) 90 (C) 100 (D) 110

[GATE ME 2007]

5)

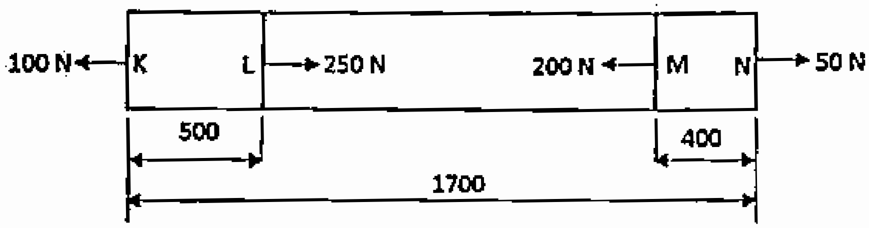
A rod of length L and area of cross section A has a modulus of elasticity E and coefficient of thermal expansion α. One end of the rod is fixed and other end is free. If the temperature of the rod is increased by ΔT, then

(a) Stress developed in the rod is $E\alpha\Delta T$ and strain developed in the rod is $\alpha\Delta T$
(b) Stress developed in the rod is zero and strain developed in the rod is $-\alpha\Delta T$
(c) Stress developed in the rod is zero and strain developed in the rod is $\alpha\Delta T$
(d) Stress developed in the rod is $E\alpha\Delta T$ and strain developed in the rod is zero

[ISRO ME 2017]

6)

The figure shows an Aluminium rod of 25 mm² cross sectional area. It is loaded at four points, K, L, M and N. Assume E = 67 GPa for Aluminium. The total change in length of the rod due to loading as shown is close to



All dimensions are in mm

(a) 30 μm
(b) – 10 μm
(c) – 30 μm
(d) 10 μm

[ISRO ME 2017]

7)

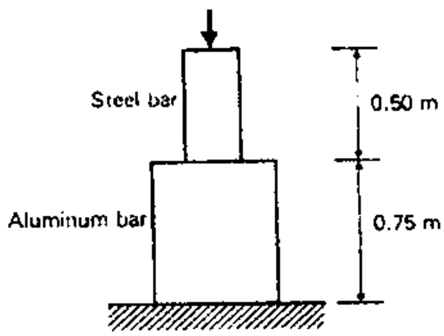
Two steel rails each of 12 m length are laid with a gap of 1.5 mm at ends at a temperature of 24°C. The thermal stress produced at a temperature of 40°C is (take $E = 2 \times 10^5$ N/mm², coefficient of thermal expansion = 12×10^{-6} /°C)

(a) 10.5 N/mm²
(b) 12.5 N/mm²
(c) 13.4 N/mm²
(d) 15.5 N/mm²

[ISRO ME 2016]

8)

A 0.75 meter aluminium bar 25 X 10^{-4} m² in cross-sectional area is attached to a 0.50 meter steel bar 15 X 10^{-4} m² in cross-sectional area, as shown in the figure. Take E (Young's modulus) value of 200 GPa for steel & 70 GPa for aluminum. Total shortening due to an axial compressive force of 175 kN is



(a) $\frac{157}{168}$ mm (b) $\frac{175}{168}$ mm (c) $\frac{175}{186}$ mm (d) $\frac{157}{186}$ mm

[ISRO ME 2014]