

ADVANCED STRENGTH OF MATERIALS (STRAIN ENERGY)

1. Calculate the strain energy stored in a bar of 2 m long ,50 mm wide & 40 mm thick, when it is subjected to a tensile load of 60 kN. Take $E=200 \text{ GPa}$.
2. A steel rod of 30 mm diameter is 2.5 m long . Find the maximum induced stress & work done at maximum elongation ,when a axial load of 50 kN is gradually applied on it. Take $E=200 \text{ GPa}$.
3. A rod of 1 m and 20 mm diameter is subjected to a axial pull of 62.5 kN .what will be the elongation of the rod ,when the load is applied i) gradually & ii) suddenly . Take $E=200 \text{ GPa}$.
4. An axial pull of 20 kN is suddenly on a steel rod of 2 m long and 1000 mm^2 in cross section .calculate the strain energy absorbed in the rod. Take $E=200 \text{ GPa}$.
5. A steel rod of 50 mm diameter is 3 m long . Find the maximum induced stress & work done at maximum elongation, when a axial load of 50 kN is suddenly applied on it. Take $E=200 \text{ GPa}$.
6. A steel bar of 3 m long and 2500 mm^2 in area hangs vertically, which is securely fixed on a collar at its lower end . If a weight of 25 kN falls on the collar from the height of 10 mm , determine the stress induced in the bar. What will be the strain energy stored in the bar? Take $E=200 \text{ GPa}$.
7. A bar of 10 mm diameter get elongated by 1 mm under a load of 5 kN . What stress would be produced in the bar by a weight of 40 kN ,if the weight falls from a height of 50 mm & strike the collar rigidly fixed with bar. Take $E=200 \times 10^3 \text{ N/mm}^2$
8. A weight of 100 N falls by gravity from a distance of 5 m ,when it is suddenly stopped by a collar at the end of a vertical rod of length of 10 m and diameter of 20 mm ,if top of the bar is rigidly fixed calculate the maximum stress and strain due to impact load, Take $E=200 \text{ GPa}$.
9. A 3 m long steel bar of 500 mm^2 cross section area ,what is instantaneous stress produce in the bar, due to an axial pull ,when extension was observed to be 1.5 mm ? Also find the magnitude of axial pull. Take $E=200 \text{ GPa}$.
10. An unknown weight falls through a height of 10 mm on a collar attached to a bar of 5 mm long and 600 mm^2 cross section area , the maximum extension of the rod is to be 2 mm .Determine the unknown weight. Take $E=200 \text{ GPa}$.