



IES COLLEGE OF ENGINEERING, CHITTIAPPILLY
DEPARTMENT OF CIVIL ENGINEERING

QUESTION BANK

MODULE – I

1. What is proportionality limit? What is its significance?
2. Sketch the stress-strain curve of mild steel and mark the salient points
3. What is Poisson's ratio?
4. What is Bulk modulus of Elasticity? Write the relationship between Bulk modulus of elasticity and Young's modulus of elasticity.
5. What is pure bending? Give an example.
6. What is point of contraflexure?
7. What are the limitations of Euler's formula to calculate the buckling load of slender columns.
8. What is strain energy?
9. What is complementary shear stress?
10. What are principal stresses and principal planes?

MODULE – II

1. Explain how the deformation of an axially loaded bar with uniformly varying cross section is calculated?
2. Explain the behavior of mild steel under gradually increasing tensile load.
3. Explain the effect of temperature change on a composite bar made of two materials.
4. How do you compute the maximum stress induced in a bar due to impact load?
5. Explain the concept of BM and SF in beams, with the help of a cantilever beam subjected to uniformly distributed load over the whole span.
6. List three important assumptions used in the theory of pure bending and explain their significance.
7. Explain the behavior of slender columns under axial compressive load.
8. Distinguish between short and long columns with reference to their behavior under axial compression.
9. Explain how the limitation of Euler's formula to calculate buckling load of columns is addressed in Rankine's formula.

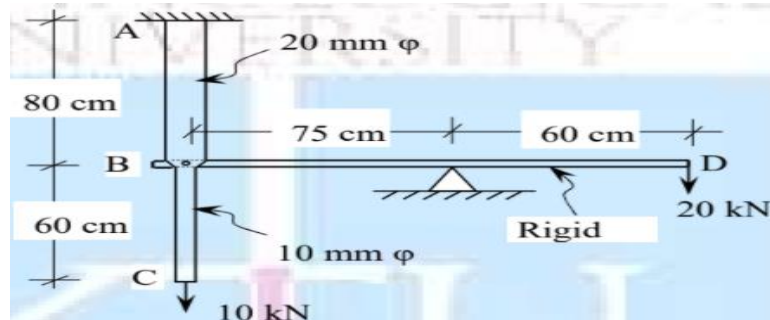
MODULE – III

1. A steel flat of cross section $25 \text{ mm} \times 6 \text{ mm}$ carries a tensile load of 12 kN. Find the stress induced in the cross section. If a circular hole of diameter 12 mm is made (normal to the flat surface), find the maximum stress induced in the cross section.

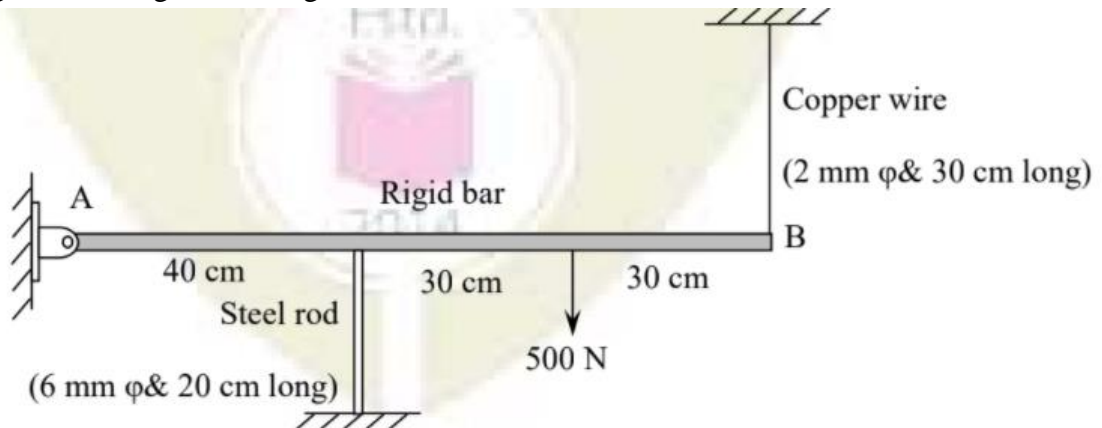


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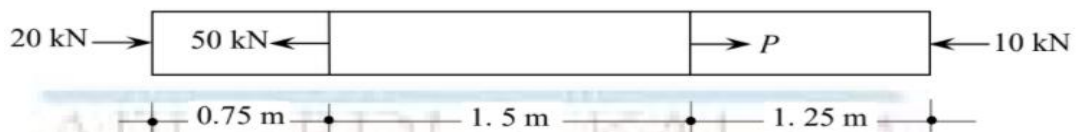
2. The bar ABC shown in figure is made of steel and has circular cross section. The bar BD is rigid. Find the stresses in portions AB and BC and the vertical deflection at C. Take $E = 210 \text{ GPa}$.



3. A rigid bar AB of length 100 cm, hinged at one end is supported by a steel rod and a copper wire as shown. Find the stresses induced in the rod and wire due to a downward load acting at 70 cm from the hinged end of the bar. Calculate the vertical deflection at B also. Modulus of elasticity of steel and copper are 200 GPa and 80 GPa respectively. Neglect the weight of the rigid bar.



4. A 32 mm diameter steel bar is subjected to forces as shown in figure. Find the value of P necessary for equilibrium and stresses in different segments. Also calculate the final length of the bar. Take $E = 200 \text{ GPa}$.

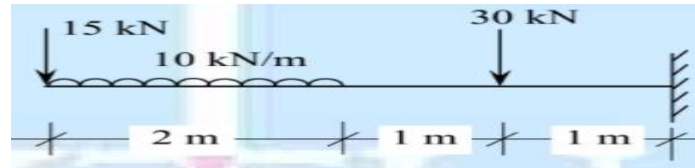


5. A cylindrical bar with two sections of lengths 50 cm and 25 cm, and diameters 20 mm and 15 mm respectively is subjected to an axial pull such that the maximum stress is 150 MN/m^2 . Calculate the strain energy stored in the bar. $E = 200 \text{ GN/m}^2$



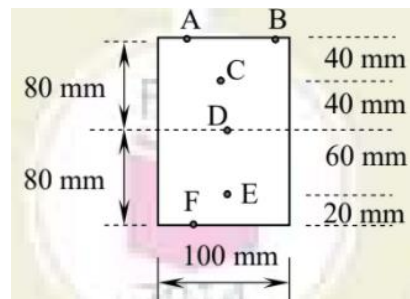
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6. Draw the SFD and BMD of the beam shown.



7. Figure shows the cross section of a beam. Find the stresses (both magnitude and nature) at points A,B,C,D,E and F, if the section carries a BM of 12 kNm. Draw the variation of stress across the cross section.

Also calculate the shear stress at these points if the cross section carries a SF of 50 kN.



MODULE – IV

1. A concrete cylinder of diameter 150 mm and height 300 mm is tested under compression. It was found that the diameter was increased by 0.0102 mm and the height was decreased by 0.165 mm under the action of a compressive load of 200 kN. Calculate the modulus of elasticity, Poisson's ratio, bulk modulus and shear modulus of concrete.
2. A tension test is carried out on a mild steel bar of 10 mm diameter. The bar yields under a load of 20 kN, it reaches a maximum load of 40 kN and breaks at 25 kN. The diameter of the bar at breaking was found to be 7 mm. The increase in length of the bar over a gauge length of 50 mm was found to be 0.029 mm under a load of 10 kN. Estimate (a) Young's modulus, (b) yield strength, (c) ultimate strength and (d) actual breaking strength.

MODULE – V

1. A bar of 12 mm diameter carries an axial pull of 15 kN. Find the normal and shear stress on a plane inclined at 60° with the axis of the bar. What is the maximum shear stress induced in the bar and the inclination of the corresponding plane?
2. At a certain point in a strained material, the stresses on two planes at right angles to each other are 50 MPa (tensile) and 80 MPa (compressive). They are accompanied by a shear stress of magnitude 20 MPa. Find the principal stresses and locate their planes. Also find the maximum shear stress and resultant stress on the plane of maximum shear stress.



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3. A timber beam $150 \text{ mm} \times 200 \text{ mm}$ is used as a simply supported beam of span 3 m. Find the maximum uniformly distributed load that can be applied in addition to a concentrated load of 5 kN acting at the mid span, if the maximum bending stress in the beam is not to exceed 8 N/mm^2 . Neglect self weight of beam.
4. A 3 m long cantilever beam of rectangular section is required to carry a udl of 10 kN/m over the whole span. If the maximum bending stress is limited to 12 N/mm^2 , find the dimensions of the cross section assuming depth to width ratio as 2.
5. A cast iron test beam 25 mm square in section and 700 mm long is simply supported at ends. It fails under a central load of 2300 N. What load at the free end will break a cantilever of the same material 50 mm wide \times 100 mm deep and 1500 mm long?
6. A solid circular shaft transmits 80 kW power at 190 rpm. Calculate the diameter of the shaft if the twist in the shaft is not to exceed 1° in 2 m length of shaft and shear stress is limited to 60 MPa. Take $G = 100 \text{ GPa}$.