SNS COLLEGE OF TECHNOLOGY

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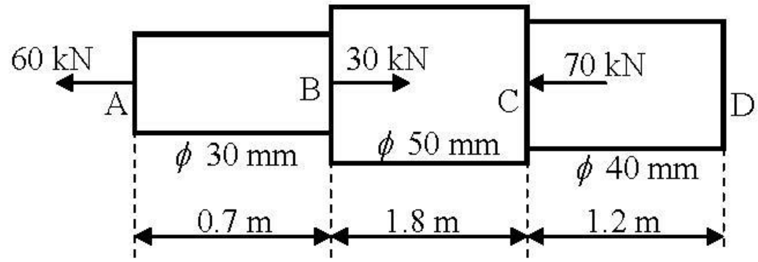
19ASB201 AERO MECHANICS OF SOLIDS
QUESTION BANK
IAE 1
2 Mark Question

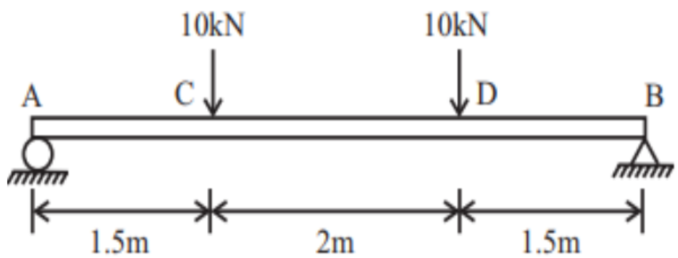
1. State Hooke's law
2. What is the elongation of the bar due its self-weight?
3. Write the relation between the three elastic moduli.
4. Differentiate statically determinate and indeterminate beams.
5. Mention the different types of loads and support conditions.
6. Write down the relation between modulus of elasticity and modulus of rigidity.
7. What is meant by Poisson's ratio? Which material has higher value of Poisson's ratio?
8. Draw the stress- strain diagram for mild steel and indicate the salient points.
9. Mention the different types of loads and support conditions.
10. Define: shear stress and shear strain.
11. Write down the relation between modulus of elasticity and modulus of rigidity.
12. What is meant by Poisson's ratio? Which material has higher value of Poisson's ratio?
13. A cylinder of diameter 150 mm and length 100 mm when subjected to an axial compressive load resulted in an increase of diameter by 0.012 mm and a decrease in length of 0.08 mm. Compute the Poisson's ratio.
14. Mention the different types of loads and support conditions
15. Define stiffness and spring index of a helical spring.
16. Define principal stresses and principal planes.

13 Mark Question

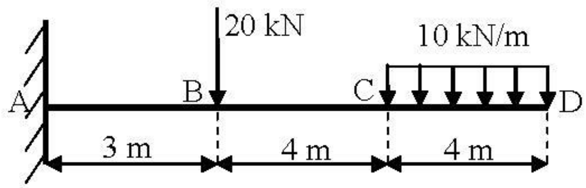
1. A bar of 30 mm diameter is subjected to a pull of 80KN. The measured extension on gauge length of 200 mm is 0.1 mm and change in diameter is 0.004. Determine the
   i) Young's modulus
   ii) Poisson's ratio
   iii) Bulk modulus
2. A stepped bar is loaded as shown in the figure. Calculate the load that must be applied at D for static force equilibrium. Also find the total elongation of the stepped bar. Take Young's modulus as 100 GPa.



3. Draw the SFD and BMD for the beam shown in the figure,



4. A cantilever beam of length 10 m is loaded as shown in figure. Draw the shear force and bending moment diagram.



5. i) Derive the relation between three elastic moduli (E, G & K).

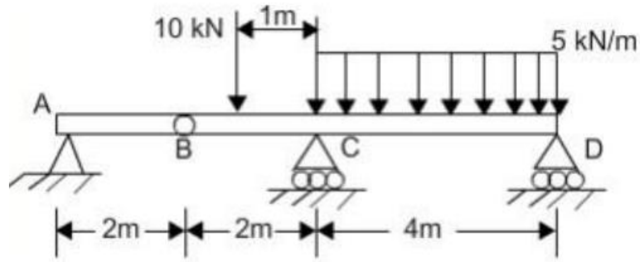
6. ii) Prove that the total extension of a uniformly tapering rod of diameters D1 & D2, when the rod is subjected to an axial load P is given by dL= 4PL/(πE D1 D2) where L is total Length of the rod.

7. A copper rod of 30 mm diameter and 400 mm is enclosed in a steel tube of internal diameter 30 mm and thickness 10 mm and are rigidly attached to act as a composite bar. The bar is subjected to an axial load of 200 kN (tensile). Find a) stresses in each material, 2) loads shared by each material, and 3) elongation of the composite bar. Take Es = 200 GPa and Ec = 100 GPa.

8. A prismatic steel bar of length 800 mm is subjected to an axial compressive load of 20 kN. The Young's modulus of the material of the bar is 207 GPa. If the maximum shortening permitted is 0.3 mm and the factor of safety is 3, find the suitable diameter of the bar.
9. A tapered bar of length 700 mm has a smaller diameter of 20 mm at one end and a larger diameter at the other end. The diameter gradient is 0.05. It is subjected to an axial tensile load of 15 kN. If the Young's modulus of the material of the bar is 2.07×10^8 kN/m^2, find the elongation of the bar.
10. A cantilever of length 4 m carries a UDL of 2kN/m run over a length of 1.5m from

the free end. Draw the shear force and bending moment diagrams for the cantilever

11. Draw the S.F.D and B.M.D for following beam.



12. Find the minimum diameter of a steel wire with which a load of 4500N can be raised so that the stress in the wire may not exceed 130N/mm^2. For the size and the length of the middle portion if the stress there is 140N/mm^2 and the total extension of the bar is 0.14mm. take E= 2×105 N/mm^2

13. A composite section consists of steel rod of 160mm diameter and outer brass tube of internal dia. 155mm and external dia. 175mm is rigidly fixed over steel rod and having length of 150mm. the composite section carries a load of 800KN. Find the stresses produced in each material and load carried by both the materials. Take E_{Steel} =2x105N/mm^2 and E_{brass}=1×105N/mm^2