

Code.No: 43034

R07

SET-1

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD**  
**II.B.TECH - I SEMESTER REGULAR EXAMINATIONS NOVEMBER, 2009**  
**FOUNDATION OF SOLID MECHANICS**  
**(AERONAUTICAL ENGINEERING)**

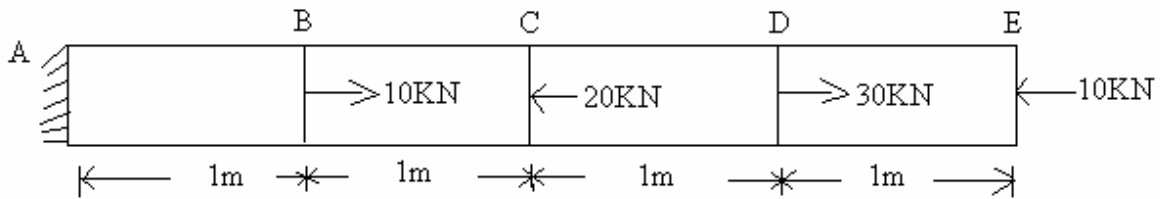
Time: 3hours

Max.Marks:80

Answer any FIVE questions  
 All questions carry equal marks

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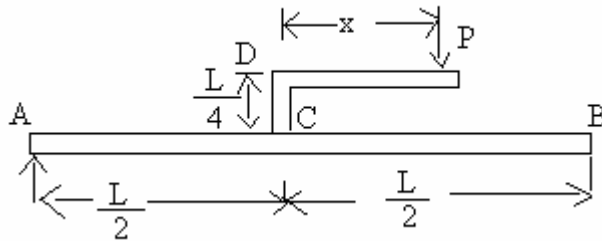
1.



For the steel bar shown above of diameter 100mm, draw the axial load diagram, and determine.

- a) Stresses in each member
- b) Net elongation [16]

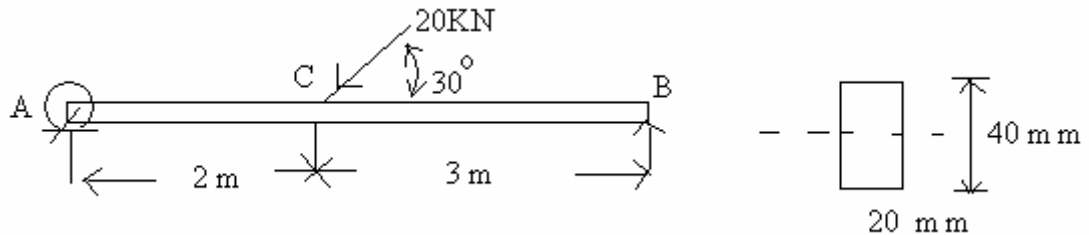
2.a) What is the importance of SFD and BMD



- b) Draw the SFD and BMD for the beam shown above. What should be the distance 'x' such that the reaction at A is zero. [6+10]

3.a) Derive the flexure equation of bending with assumptions using standard notations

b)



Determine the maximum bending stress for the steel beam shown above [10+6]

Cont.....2

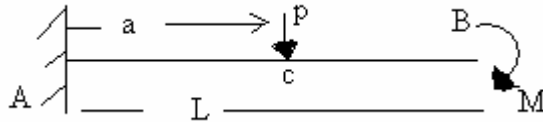
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**:2:**

**SET - I**

- 4.a) Explain the presence of shear stresses due to transverse shear loads with the help of a neat sketch.  
b) Derive the Equation for shear stress of circular section and draw the shear stress variation. [8+8]

- 5.a) Derive the flexure Equation of deflection

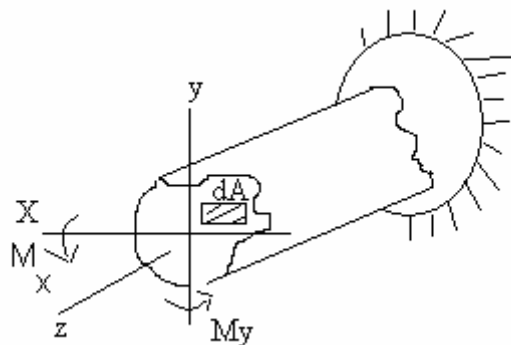


- b) For the beam shown above, determine the slope and deflection at B, using method of superposition. [8+8]

- 6.a) Explain the stresses induced in thin walled pressure vessel with the help of a neat sketch when subjected to internal pressures  
b) A cylinder of internal diameter 2 m and thickness 5mm is subjected to an internal fluid pressure of  $1.5 \frac{N}{mm^2}$ . Determine the longitudinal stress and circumferential stresses. [10+6]

7. What are the types of welded joints? Show various welded joints subjected to Bending loads, shear loads and Twisting loads with the help of neat sketches. [16]

8. For the unsymmetrical section shown, Derive the Equation for bending stress and locate the neutral axis [16]



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SET-2

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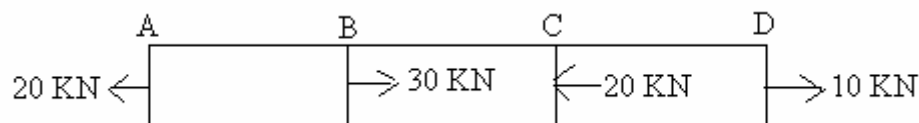
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**Max.Marks:80**

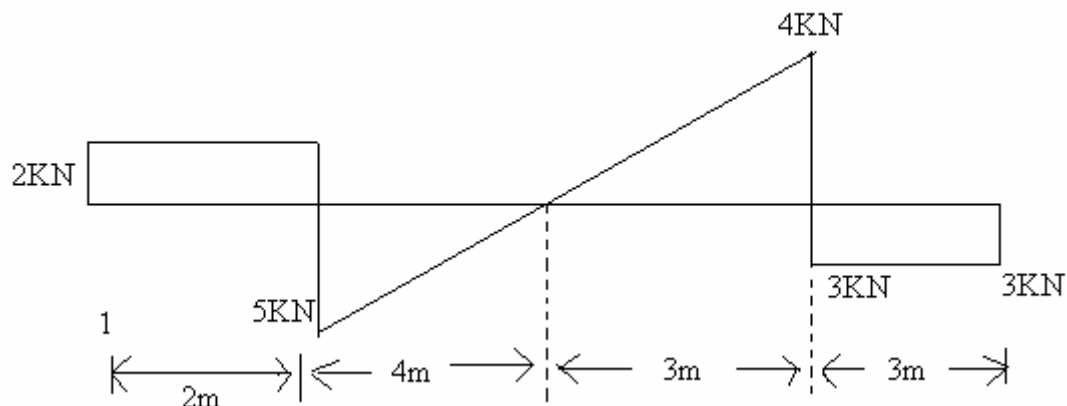
**Answer any FIVE questions**  
**All questions carry equal marks**

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- 1.a) Explain the stress-strain diagram for mild steel with neat sketch and mark various limits of stresses.  
b) What is the significance of load diagrams and draw the load diagram for the following steel bar



- 2.a) Define shear force and Bending moment and derive the relations with standard notations  
b) The shear force diagram is shown below. Determine the loading and draw the B.M diagram.



- 3.a) Explain the presence of transverse shear stresses in beams due to transverse shear load  
b) Derive the Equation for shear stress in flanges and web of an I section and draw the variation of shear stress
- 4.a) Define Neutral axis and section Modulus of a beam

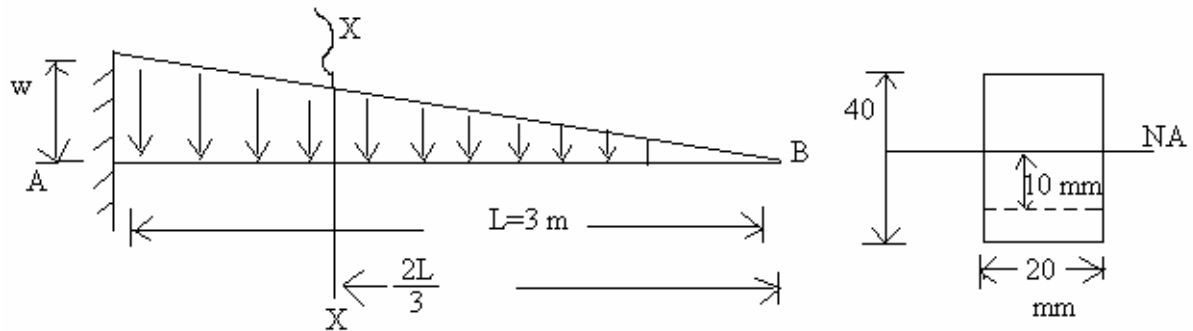
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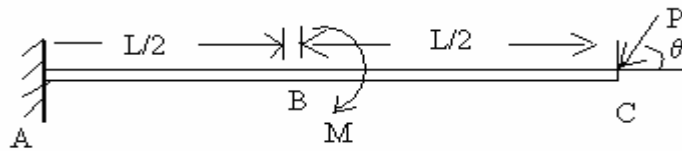
SET II

b)



Determine the bending stress X-X at the section at a distance of 10mm below the neutral axis.

5.a) Derive the flexure Equation of deflection



b) Determine the deflection at C for the cantilever beam loaded as shown above.

6. A cylindrical thin drum of 1000 mm in diameter and 3000 mm long has a shell thickness of 10mm. If the drum is subjected to an internal pressure of 3 N/mm<sup>2</sup>

Determine:

- Change in diameter
- Change in length
- Change in volume

$$E=2 \times 10^5 \text{ N/mm}^2, \text{ Poisson's ratio}=0.25. \quad [16]$$

7. What are the various types of semi permanent joints. Explain in detail with neat sketches [16]

8.a) What are the different cases of unsymmetrical bending

b) Derive the Equation for bending stress when a symmetrical section subjected to loading at an angle ' $\theta$ ' to the vertical. [8+8]

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SET-3

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Time: 3hours

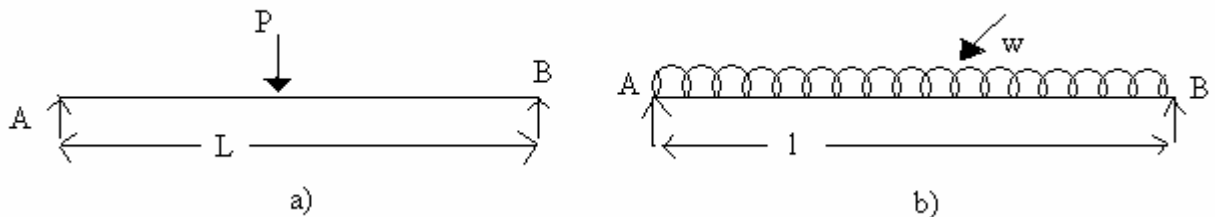
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- 1.a) Why steel is more elastic than rubber. Explain  
b) Explain the mechanical properties of a material briefly in detail. [6+10]
- 2.a) The intensity of loading on a simply supported beam of 5m span increases gradually from 1 KN/m at one end to  $s$  KN/m run on the other end. Find the position and amount of maximum bending moment. Also draw the S.F. And B.M. diagrams. [16]

3.a)



For the beams shown with different loading conditions, determine the ratio of Maximum bending moments,  $\frac{M_a}{M_b}$ . What should be the value of 'P' such that both the beams will have same bending moment

- b) What is the significance of sectional modulus. [10+6]

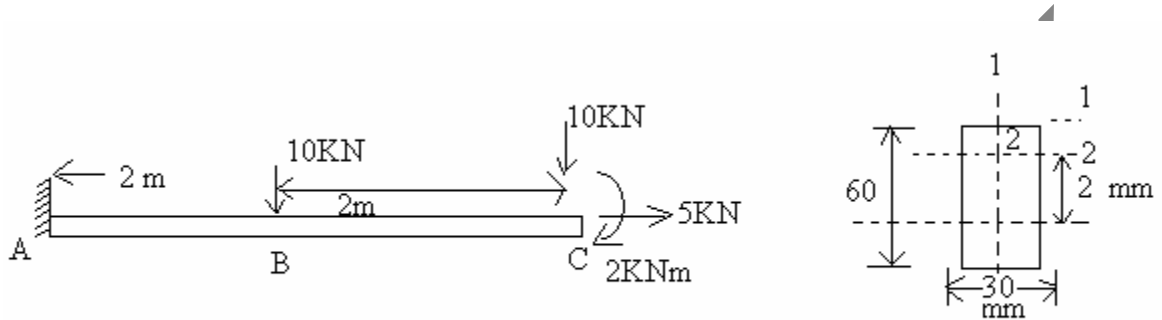
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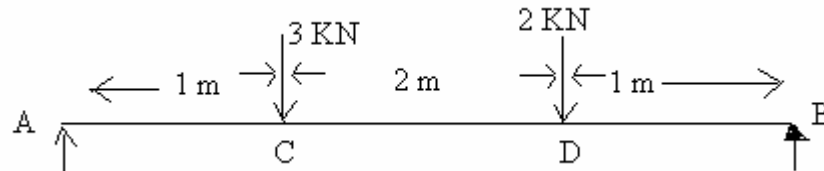
**SET III**

- 4.a) Derive the equation for shear stress due to transverse shear load with standard notations  
 b)



For the beam shown, Determine the shear stress Between A & B at point '2' on the cross section. [16]

- 5.a) Explain the procedure of finding deflections using Macaulay's method



- b) Determine the deflection at the centre of the beam.  $E=2 \times 10^5 \text{ N/mm}^2$ ,  $I=2 \times 10^6 \text{ mm}^4$  [8+8]

- 6.a) Define the stresses in thin walled pressure vessels.  
 b) A boiler is subjected to an internal steam pressure of  $3 \text{ N/mm}^2$ . The thickness of the boiler plate is  $2.5 \text{ cm}$  and the permissible tensile stress is  $125 \frac{\text{N}}{\text{mm}^2}$ . Determine the maximum diameter, when the efficiency of longitudinal joint is  $90\%$  and that of circumferential joint is  $35\%$ . [8+8]

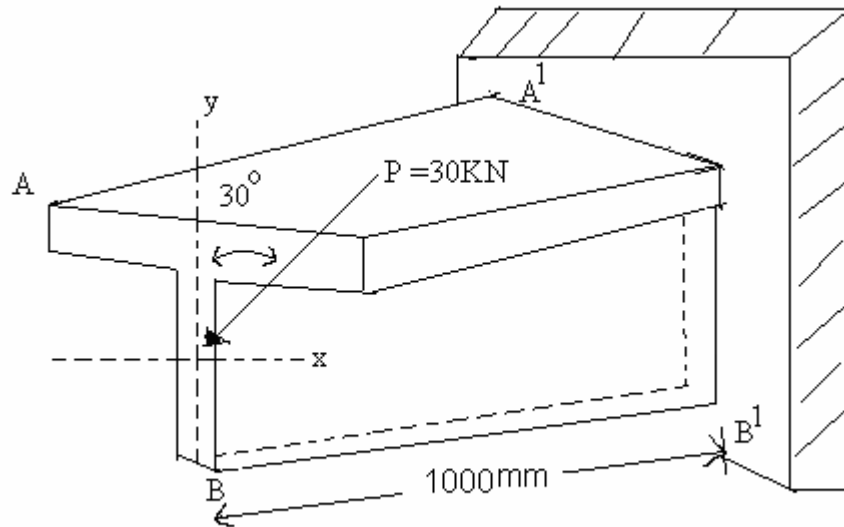
7. What are the types of riveted joints. Explain various joints with the help of neat sketches. [16]

**Cont....3**

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SET III



8.

Determine the bending stress at  $A'$  and  $B'$  for the T-section shown. Flange dimension 100mm width and web dimensions 120mm height with uniform thickness of 5mm. [16]

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SET-4

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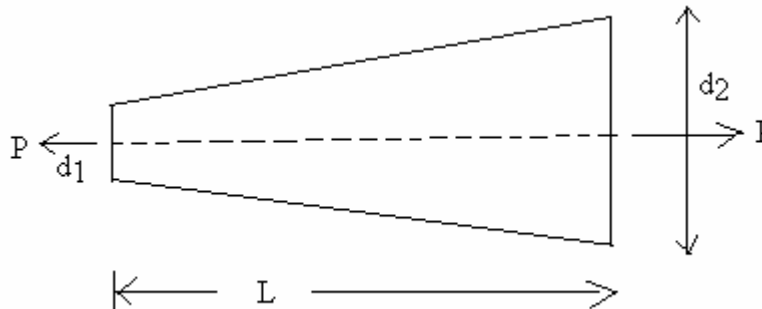
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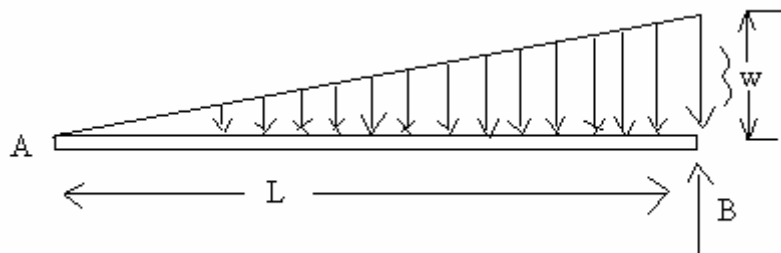
- 1.a) Explain the different types of stresses with neat sketches.



b)

For the tapered bar shown, derive the equation for total elongation  
[6+10]

- 2.a) For the beam shown in figure, Draw the BMD and determine the location where maximum bending moment occurs



- b) Explain the significance of point of Contra-flexure. [10+6]
- 3.a) Explain the presence of shear stresses in beams due to transverse shear loads
- b) Derive the condition for maximum shear stresses in triangular section [8+8]

Cont....2

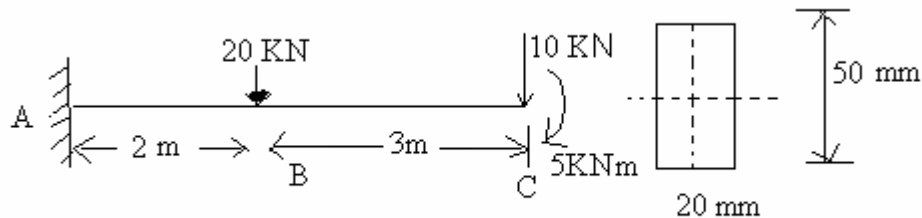


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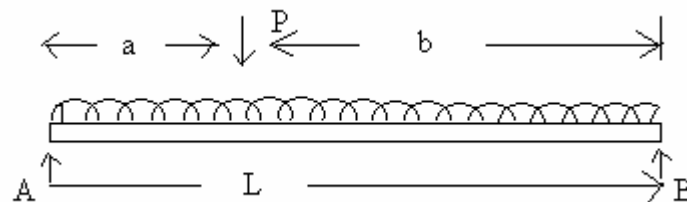
SET IV

4.a) What are the assumptions in simple bending theory



b) Determine the maximum bending stress for the beam shown above [6+10]

5.a) Define the radius of curvature and deflection



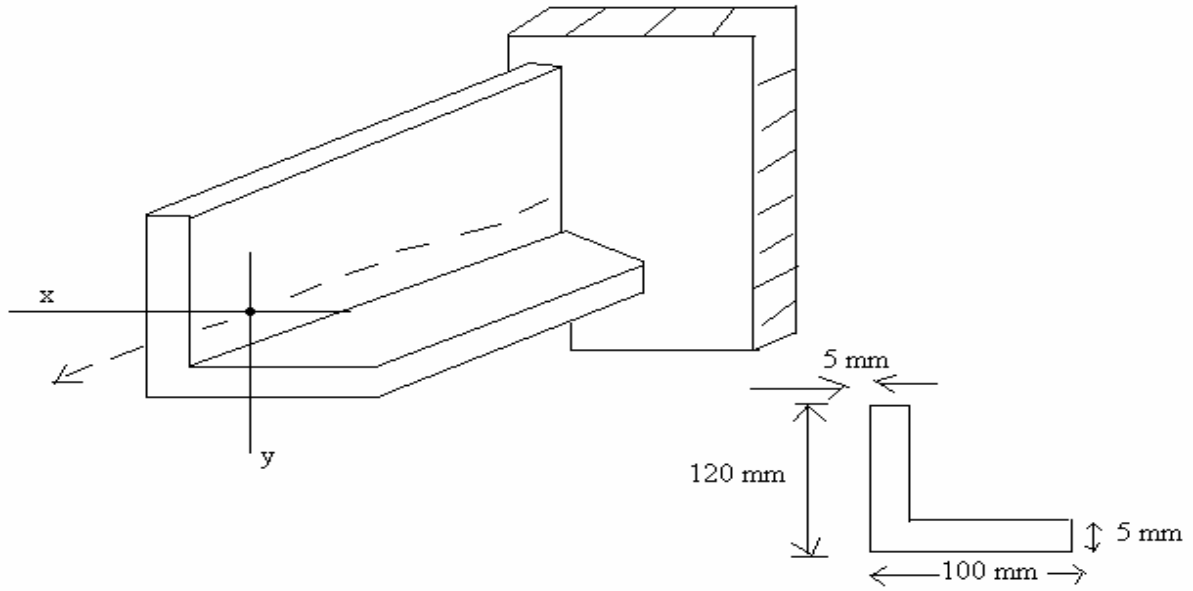
b) For the SSB, with U.D.L and point load P shown above, determine the deflection under load P using double integration method [8+8]

6. Derive the equation for change in diameter, change in length and change in volume when a thin walled cylinder is subjected to an internal pressure. Use the standard rotations. [16]

7.a) Explain double rivetted butt joint with double cover plate with the help of neat sketch

b) What is the effect of considering friction between the joints. [10+6]

8.



Determine  $I_x$ ,  $I_y$  and  $I_{xy}$  for the unsymmetrical section shown. [16]

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