Code No: R22031 **R10** SET - 1

II B. Tech II Semester Supplementary Examinations, April/May-2017
MECHANICS OF SOLIDS
(Com. to ME, AME, MM)

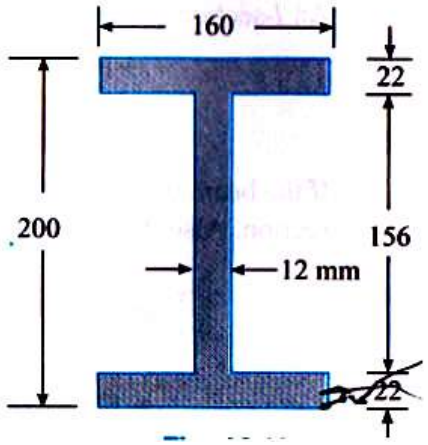
Time: 3 hours Max. Marks: 75

Answer any **FIVE** Questions
All Questions carry **Equal** Marks

1. a) A cylindrical bar 1 cm diameter is subjected to an end thrust of 4000 N and is enclosed in a closely fitting sheath which reduces lateral expansion by one-half of its value if free. Determine (i) the longitudinal strain in the bar, (ii) the pressure exerted by the sheath, and (iii) the strain energy per unit volume. E=210,000 N/mm^2; v=0.283.
   b) Derive relation between E and G.

2. A horizontal beam is simply supported at its ends and carries a uniformly distributed load of 40 kN/m between the supports, which are 7.5 m apart. Counter-clockwise moments of 100 and 80 kNm are applied to the two ends. Draw the B.M. diagram and find (i) the reactions at the supports, and (ii) the position and magnitude of the greatest B.M.

3. A rolled steel joist 200 mm × 160 mm wide flange has 22 mm thick and web 12mm thick. Find the proportion, in which the flanges and web resist shear force.



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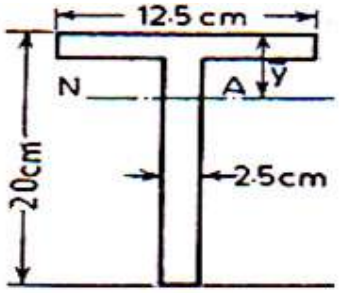
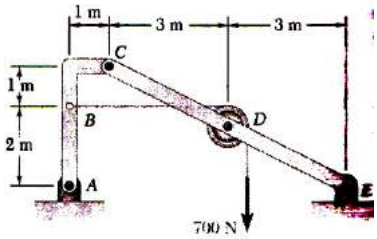
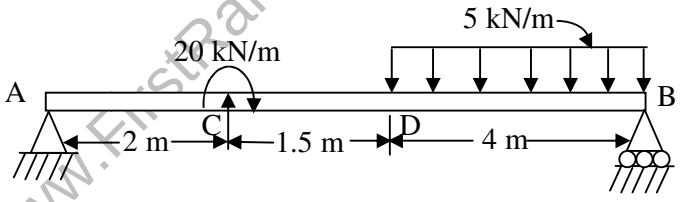
4. A beam AB supported at its ends has a span of 2 m and carries a uniformly distributed load of 200 kN/m over the entire span. The cross-section of the beam is a T-section, having flange width 125 mm, flange thickness 25 mm, web thickness 25 mm and overall depth 200 mm. Calculate the maximum shear stress in the beam. Also draw the shear stress distribution marking principal values.



5. Using method of sections, determine the forces in each member of the truss as shown in Fig.



6. A simply supported beam is loaded as shown in figure. Determine the deflection at the mid-span and under the concentrated load. I=3000 cm^4, E=200 GPa.



7. A thin cylinder having internal diameter of 30 cm and wall thickness 1 cm is required to withstand an internal pressure of 5 MPa. It is strengthened with a single layer of 2 mm diameter wire closely wound over it. Find the initial tensile stress in the wire if the stress in cylinder in not to exceed 50 MPa. Also find the final stress in the wire. For wire E_w= 200 GPa. For cylinder E_c=100 GPa and Poisson's ratio, v=0.3.

8. A composite cylinder has the following radii:-
   r_1=57 mm, r_2=115 mm, r_3=82.5 mm.
   Shrinkage pressure, p_s=28 MPa.
   Internal pressure, p_s=340 MPa.
   Calculate the resultant hoop stresses and radial shrinkage allowance. E=200 GPa.
   If α 12.5 × 10^{-6} per ºC, calculate the temperature by which cylinder should be heated to make the assembly.