Code No : **19CET301**

II B. Tech I Semester Regular Examinations, March - 2021
STRENGTH OF MATERIALS-I
(Civil Engineering)

Time : 3 Hours   **Max. Marks : 60**

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Note : Answer **ONE** question from each unit **(5 × 12 = 60 Marks)**

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UNIT-I

1. a) Draw the stress – strain diagram for mild steel and explain the salient features   [4 M]

   b) Determine the elongation of the stepped steel bar subjected to axial forces as shown in Fig.1. Also find the normal stress in each segment of the stepped bar.   [8 M]
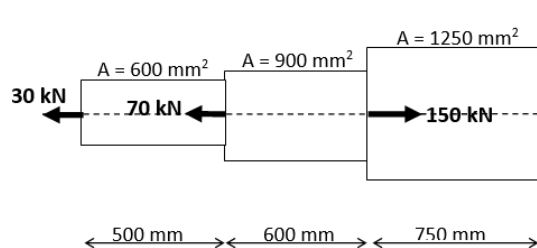

Fig.1

(OR)

2. a) Derive the relation between the modulus of elasticity, bulk modulus and Poisson's ratio.   [4 M]

   b) A solid steel bar of length 600 mm and 60 mm diameter, is placed inside an Aluminium tube of 75 mm inside diameter and 100 mm outside diameter. The Aluminum tube is 0.5 mm longer than steel bar. An axial load of 600 kN is applied to the bar and tube through rigid cover plates. Find the stresses developed in the steel bar and Aluminium tube. E for steel = 2×10^5 N/mm^2 and E for Aluminium = 0.7×10^5 N/mm^2.   [8 M]

UNIT-II

3. Draw the shear force and bending moment diagrams for a beam supported and loaded as shown in Fig.2   [12 M]
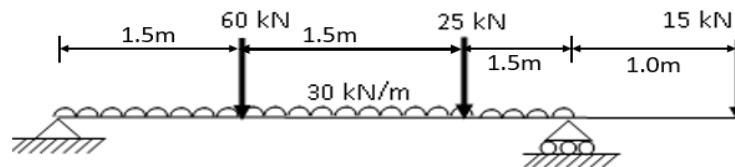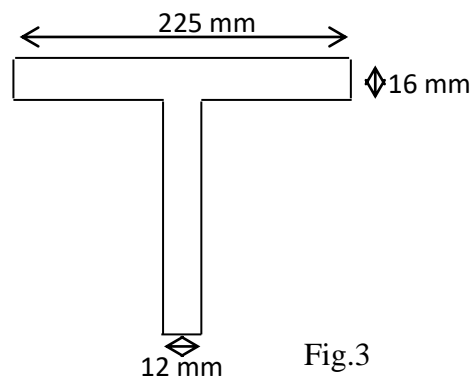

Fig.2

(OR)

4. A simply supported beam of span 5 m carries uniformly distributed load of 20 kN/m over the length of left-half of the span, together with concentrated loads of 50 kN, 60 kN and 30 kN at distances 1 m, 2 m and 4 m respectively from right support. Draw the shear force and bending moment diagrams and find the magnitude and position of the maximum bending moment.   [12 M]

5. a) State and explain the assumptions made in the theory of simple bending. [4 M]

5. b) A steel beam of unsymmetrical I-section, top flange 200 mm×20 mm, bottom [8 M]
   flange 150 mm×20 mm, thickness of web is 16 mm and total depth of the beam
   is 300 mm, is simply supported over a span of 5 m. If the permissible stresses
   are 125 N/mm^2 in compression and 150 N/mm^2 in tension, determine the safe
   uniformly distributed load carried by the beam.

(OR)

6. A steel beam cross-section shown in Fig.3, is subjected to shear force of 300 [12 M]
   kN. Draw the shear stress distribution across the depth of the section. The total
   depth of the section is 250 mm. Also determine ratio of maximum shear stress
   to the mean shear stress.

225 mm

16 mm

12 mm   Fig.3

UNIT-IV

7. Design a hollow steel shaft to transmit 100 kW at 150 rpm. The shear stress is [12 M]
   limited to 60 N/mm^2 and the angle of twist is not to exceed 1.25^0 in 3 m length
   of shaft. Assume the internal diameter is 0.75 times the external diameter. Take
   C = 0.8 x 10^5 N/mm^2.

(OR)

8. An open coiled steel helical spring has 10 coils of 75 mm mean diameter and [12 M]
   the diameter of the wire is 12 mm. The angle of the helix is 22^0. Determine the
   load that would cause deformation of 30 mm in the spring and the
   corresponding bending and shear stresses developed in the spring.

UNIT-V

9. A steel cylindrical shell of 10 mm thickness, 600 mm diameter and 3 m long is [12 M]
   carrying fluid at a pressure of 2 N/mm^2. Find the change in the diameter,
   change in length and change in volume of the cylinder.

(OR)

10. A steel compound cylinder is made by shrinking a cylinder of external diameter [12 M]
    250 mm and internal diameter 200 mm over another cylinder of external
    diameter 200 mm and internal diameter 150 mm. The radial pressure at the
    junction after shrinkage is 10 N/mm^2. Find the final stresses if the cylinder is
    subjected to an internal fluid pressure of 75 N/mm^2.

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