



II B.Tech I Sem Supplementary Examination, July-2022
Strength of Materials – I
 (CIVIL)

Time: 3 Hours.

Max. Marks: 70

Note: 1. Answer any FIVE questions.

2. Each question carries 14 marks and may have a, b as sub questions.

1.a) Sketch the stress strain curve for ductile and brittle materials and indicate the salient points. (6M)

b) A rod has diameter of 120mm at one end and tapers uniformly to a diameter of 60mm over a length of 400mm. Find the elongation of the rod, when it is subjected to a load of 200kN. $E = 200\text{GPa}$. (8M)

2) The steel bolt shown in Figure has a thread pitch of 1.6 mm. If the nut is initially tightened up by hand so as to cause no stress in the copper spacing tube, calculate the stresses induced in the tube and in the bolt if a spanner is then used to turn the nut through 90° . Take E_c and E_s as 100 GPa and 209 GPa respectively. (14M)

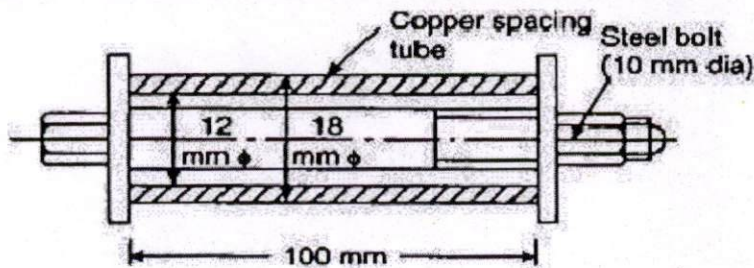


Fig.1

3. a) Derive the relation between Shear force, Bending moment and rate of loading. 6M

b) The overhanging beam ABC is supported at A and B, the span AB being 6 m. The overhang BC is 2 m (see Fig.2). It carries a uniformly distributed load of 30 kN/m over a length of 3 m from A and concentrated load of 20 kN at free end. Draw SF and BM diagrams. Indicate the salient points. 8M

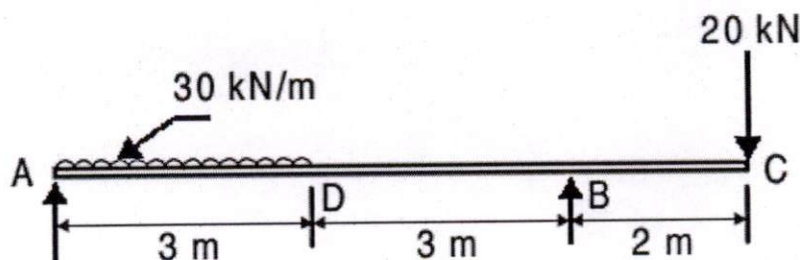


Fig.2

4. A simply supported (SS) beam has a span of 5 m and carries a UDL of 20 kN/m in the left half and a UDL of 40 kN/m in the right half of its length. Draw the SF and BM diagrams and find the position and magnitude of maximum BM in the beam. (14M)

5. Derive from the basics, simple bending equation (Flexure formula) and state the Assumptions made. (14M)

6. a) Derive the expression for shear stress for a beam section when it is subjected to a shear force. (7M)

b) A hollow circular section of outside diameter 200 mm and thickness 10 mm carries an SF of 25 kN. Find the maximum shear stress and the shear stress at the inner edge and draw the shear stress distribution diagram. (7M)

7. A simply supported beam of span 6m subjected to two point loads 2kN and 4 kN are acting at a distance of 2m and 4m respectively from the left end. EI is constant. Use Macaulay's method. 14M

- Determine the
- i) deflection under the loads
 - ii) Slopes at the ends
 - iii) position of max deflection
 - iv) Magnitude of maximum deflection.

8. A plane element is subjected to the stresses as shown in fig.3. determine (a) the principal stresses and their directions and (b) the maximum shearing stresses and the directions of the planes on which they occur. 14M

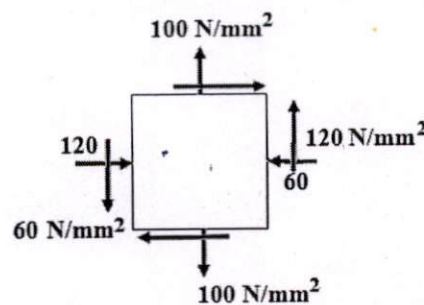


Fig.3