Code No: 153BU

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JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
B.Tech II Year I Semester Examinations, March - 2022
STRENGTH OF MATERIALS – I
(Civil Engineering)

Time: 3 Hours **Max. Marks: 75**

Answer any five questions
All questions carry equal marks

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1.a) Derive the relation between the three elastic modulii(E,G and K).
b) Explain the Strain Energy and deduce the expressions due to gradual and suddenly applied loading. [7+8]

2.a) Draw the shear force and bending moment diagrams for the simply supported beam as shown in Figure 1. Also calculate the maximum bending moment.

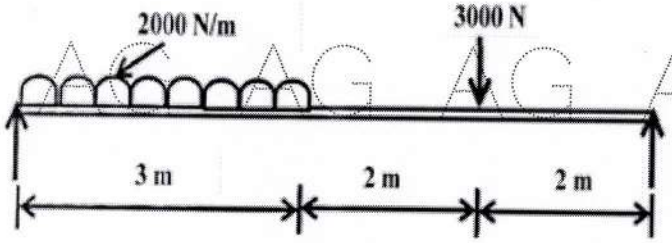

Figure: 1

b) Draw the Shear force and bending moment diagrams for a cantilever beam carrying an udl of intensity 'w' N/m and a point load 'P'N at the free end. [8+7]

3.a) Derive pure bending equation from first principles.
b) A 400 mm × 200 mm I –girder has 10 mm thick flanges and 8 mm thick web it is subjected to a shear force of 100kN at a particular section. Find the maximum shear stress in the web and flange. [8+7]

4.a) Determine the slope at supports and deflection at points D and C by Conjugate beam method shown in Figure 2.

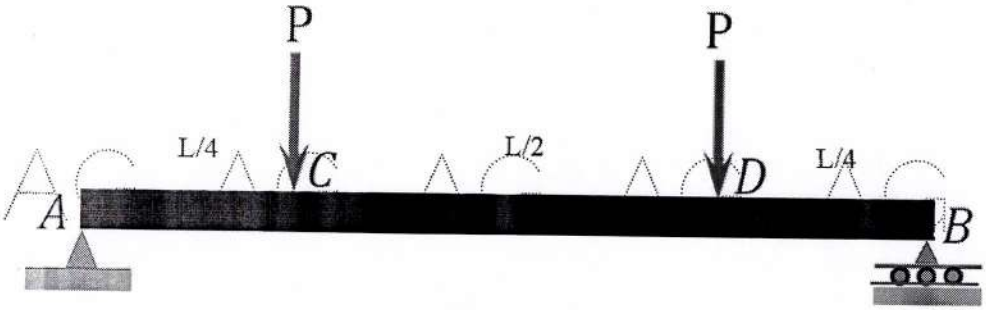

Figure: 2

b) State the Mohr's theorems and limitations of the 'Moment Area method'. [10+5]

5. The cross-section of simply supported beam of span 4m is shown in Figure 3. The allowable bending stress in tension is 20MPa. Determine allowable bending stress in compression and the intensity of uniformly distributed load that can be placed over the entire span. [15]

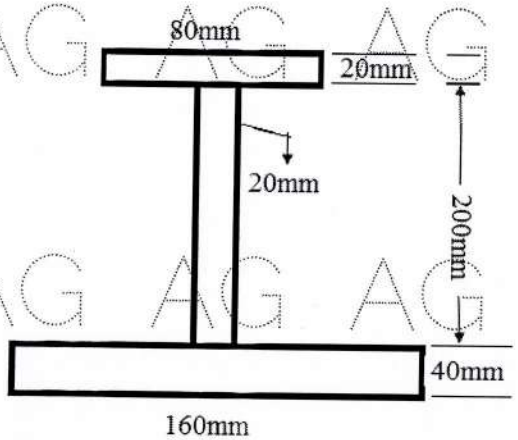

Figure: 3

6.a) A rectangular block of material is subjected to normal and shearing stresses on the planes shown in Figure 4. Find analytically
i) the direction and magnitude of each of the principal stress
ii) magnitude of the greatest shear stress.

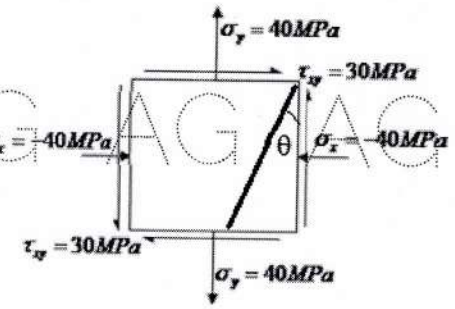

Figure: 4

b) Solve the above problem shown in **Figure 4** by using Mohr's circle method. [8+7]

7. Determine the diameter of a bolt which is subjected to an axial pull of 9 kN together with a transverse shear force of 4.5kN using:
a) Maximum Principal stress theory, and
b) Maximum Principal strain theory.
Given the elastic limit in tension = 225 N/mm^2, factor of safety = 3 and poisson's ratio = 0.3. [15]

8.a) A cantilever of 4m span length carries a load 40 kN at its free end. If the deflection at the free end is not to exceed 8mm, what must be the moment of inertia of the Cantilever section?

b) A simply supported 6m rolled steel joist carries a U.D.L of 10 kN//m length. Determine slope and deflection at a distance of 3m from one end of the beam. [8+7]

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