8. Construct the bending moment and shearing force diagram for the beam as shown in Fig. 1.2

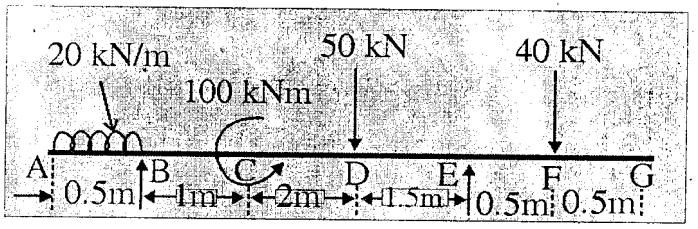

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Fig. 1.2

9. (a) Determine the slope and deflection at the free end of a cantilever beam as shown in Fig. 1.3 by moment area method (Take EI = 3000 kNm²)

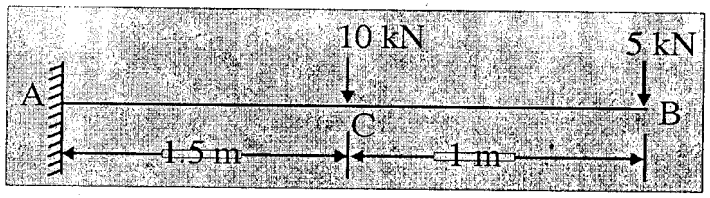

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Fig. 1.3

(b) Using method of virtual work, find the horizontal deflection of the free end of the frame shown in Fig. 1.4. E = 250 KN/mm². I = 40 × 10⁶ mm⁴

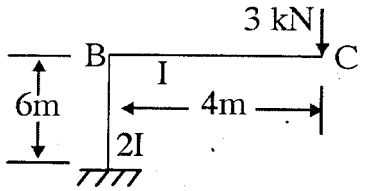

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Fig 1.4

B.Tech. 3rd Semester (Civil. Engg.) F Scheme
Examination, December–2016
STRUCTURALANALYSIS–I
Paper–CE–201–F

Time allowed : 3 hours] *[Maximum marks : 100*

*Note : **Q. 1 is compulsory**. Students have to attempt **five** questions in total at least **one** question from each section. All questions carry equal marks.*

1. (i) Define Modular ratio. 10×2=20
   (ii) What is Williot's diagram ?
   (iii) What is meant by Muller-Breslau's principle ?
   (iv) What do you mean by Mohr's correction ?
   (v) Define relation between E, C and K.
   (vi) Define Maxwell law of reciprocal theorem.
   (vii) Define end conditions of the coloumn.
   (viii) Define Virtual displacement and Virtual Work done.
   (ix) Define principle stresses and principle strains.
   (x) Differentiate between determinate and Indeterminante Structure.

2. Three parallel wires in the same vertical plane jointly support a load of 15 KN. The middle wire is of steel

and is 1 m long, while the outer ones of brass, the length of each being 1.05. The area of cross-section of each wire is 200 mm^2. After the wires have been so adjusted as to carry one-third of the load, a further load of 35 KN is added. Find the stress in each wire and fraction of the whole load carried by the steel wire. 20

3. A point in a strained material is subjected to stresses as shown in Fig. 1.1. Using Mohr's circle method, determine the normal and tangential stresses across the oblique plane. Check the answer analytically. 20

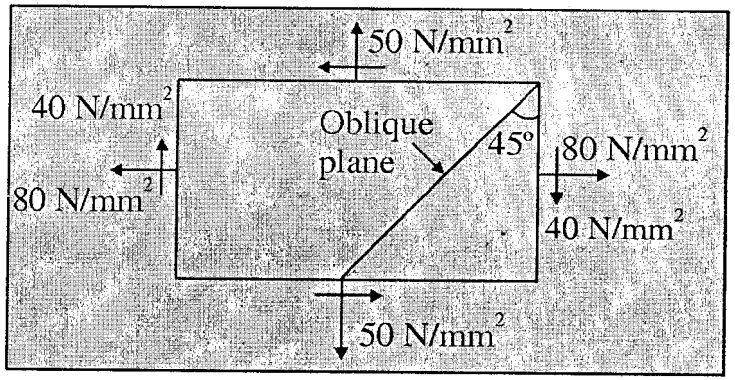

Fig. 1.1

4. (a) A rectangular beam 300 mm deep is simply supported over a span of 5 metres. Determine the uniformly distributed load per metre which the beams may carry, if the bending stresses should not exceed 120 M/mm^2. Take $I = 8 \times 10^6$ mm^4. 10

(b) Find the maximum shear stress induced by a load of 4 KN in the vertical section of a hollow beam of a square section if the outside width is 10 cm and thickness of materials is 2 cm. 10

5. A hollow shaft, having an internal diameter 40% of its external diameter, transmits 575.8 kW power at 100 r.p.m. Determine the external diameter of the shaft if the shear stress is not to exceed 60 N/mm^2 and the twist in a length of 2.5 m should not exceed 1.3 degree. Assume maximum torque = 1.25 mean torque and modulus of rigidity = 9×10^4 N/mm^2. 20

6. Determine the maximum stress induced in a horizontal strut of length 3.5 m and rectangular cross-section 45 mm wide and 85 mm deep when it carries an axial thrust of 150 kN and a vertical load of 9. kN/m length. The strut is having pin joints at its ends. Take E = 210 GN/m^2. 20

7. A steel tube having 75 mm outer diameter, 68 mm inner diameter and 4.8 m long is used as a strut with both ends hinged. The load is parallel to the axis of the strut but is eccentric. Find the maximum value of eccentricity so that crippling load on strut is 75% of the Euler's crippling load. Take : E = 210 GN/m^2 and yield strength 330 MN/m^2. 20