5E5061

Roll No. 15CCTC049 [Total No. of Pages : 4

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B.Tech. V Semester (Main &Back) Examination, Nov./ Dec. - 2017

Civil Engineering

5CE1A Theory of Structures - I

Time : 3 Hours **Maximum Marks : 80**

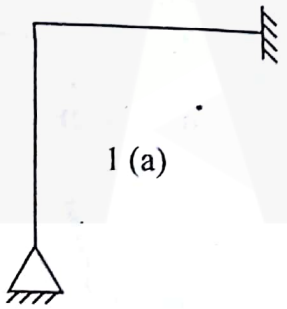
Min. Passing Marks : 26

Instructions to Candidates:

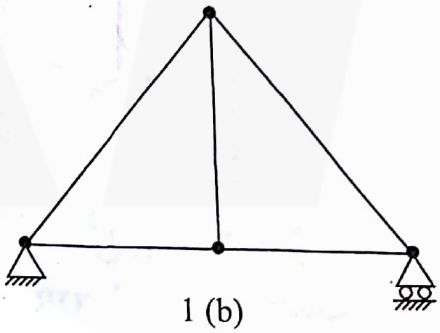
*Attempt any **five questions**, selecting **one question** from **each unit**. All Questions carry **equal** marks. (Schematic diagrams must be shown wherever necessary. Any data you feel missing suitably be assumed and stated clearly). Units of quantities used/calculated must be stated clearly.*

Unit - I

1. a) Define kinematic, indeterminacy. Calculate kinematic indeterminacy for the following structures. **(6)**



1 (a)



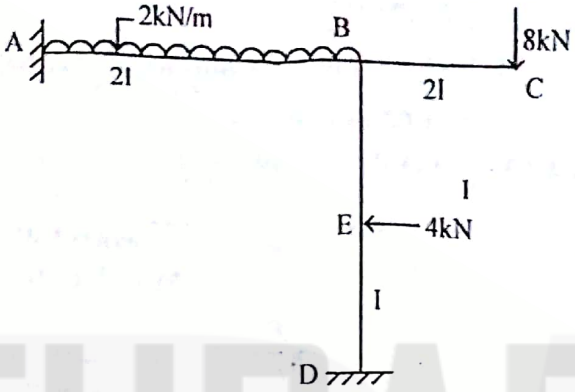
1 (b)

b) Write and prove Maxwell Betti's generalized reciprocal theorem. **(4)**

c) In a cantilever Beam AB, of span *l*, fixed at A and carrying a point load P at the free end B, the deflection 'y' of a section X, distance x from A is given by $y = \frac{px^2(3l-x)}{6EI}$. If the cantilever is now loaded with a concentrated load W at X and propped at B to the same level as A, show by the reciprocal theorem, that the reaction $R_B = \frac{Wx^2(3l-x)}{2l^3}$ E is modulus of elasticity and I is moment of inertia of the beam. **(6)**

OR

1. Analyze the rigid frame shown in fig. 2 using slope-deflection method. Draw the BMD. **(16)**

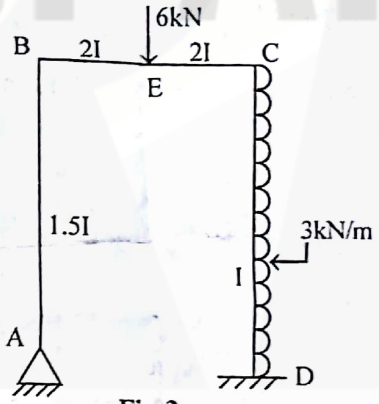


AB = 4m, 2I
BE = ED = 2m, I
BC = 2m, 2I

Fig. 2

Unit - II

2. A portal frame ABCD as shown in fig. 3 is hinged at A and fixed at end D. Analyze the frame using moment distribution method and draw the BMD and deflected shape. **(16)**

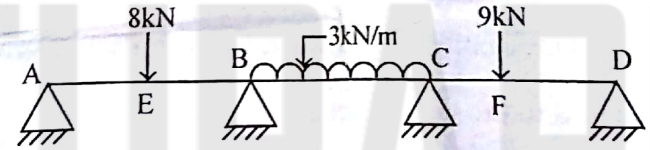


AB = 3m, 1.5I
BC = 2m, 2I
CD = 4m, I
BE = 1m, 2I

Fig.3

OR

2. A horizontal beam ABCD is supported on hinges at all the supports. The beam is loaded as shown in Fig. 4. Take moment of inertia as $2.4 \times 10^6 mm^4$ and $E = 2 \times 10^5$ N/mm^2. Solve the beam using moment distribution method if the support B sinks by 30mm and C sinks by 20mm down respectively from the original some level. Draw BMD and deflected slope of beam. **(16)**



AE = EB = 1.5m
BC = 3m
CF = 1m
FD = 2m

Fig. 4

Unit-III

3. Determine the horizontal deflection of roller support C of the frame shown in fig. 5 due to applied load of 80kN being applied at B. Area of members AB, BC and BD are each of 800mm^2 and AD and CD are each of 1600mm^2 area. Take E = 2.06×10^5 N/mm^2. **(16)**

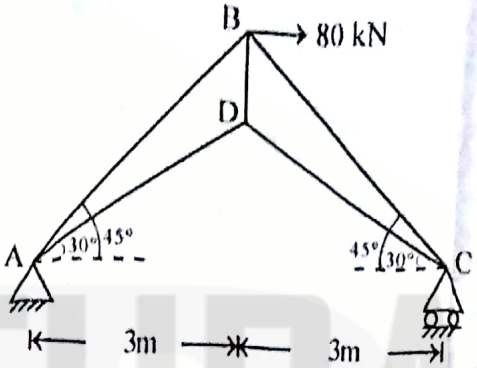


Fig. 5

OR

3. Find the forces in all the members of the frame shown in fig. 6. All the bars of some area of cross section and of some material. Use strain energy principles for solution. **(16)**

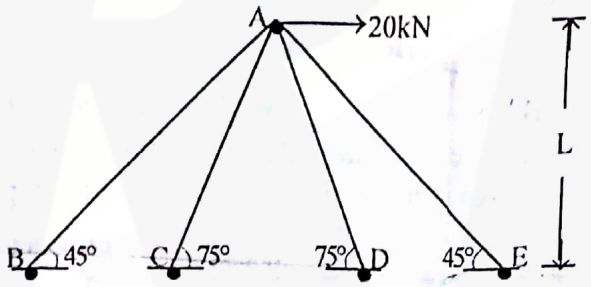


Fig. 6

Unit-IV

4. a) Derive the generalized column flexure formula to obtain stress 'f' at any point (x,y) in a column section subjected to axial load and moments. Write the sign conventions to be adopted while applying the formula. **(8)**

   b) A fixed beam AB, carries a point load W at a distance L/4 from support A. Calculate support moments using column analogy method. Take EI constant. Draw BMD. **(8)**

OR

4. Solve portal frame ABCD using column analogy method. Draw BMD fig. 7. **(16)**

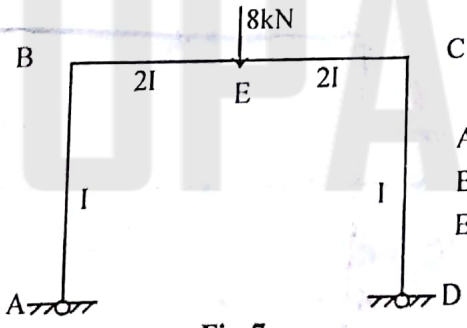


Fig. 7

Unit - V

5. In fig. 8, plan of a tripod is shown. The feet A, B and C being in some horizontal plane and apex D being 3.25m above the plane. Horizontal force of 100 kN and 50 kN are applied at D in the direction shown in fig. 8. Find the forces in member assuming that all joints are pin joints. **(16)**

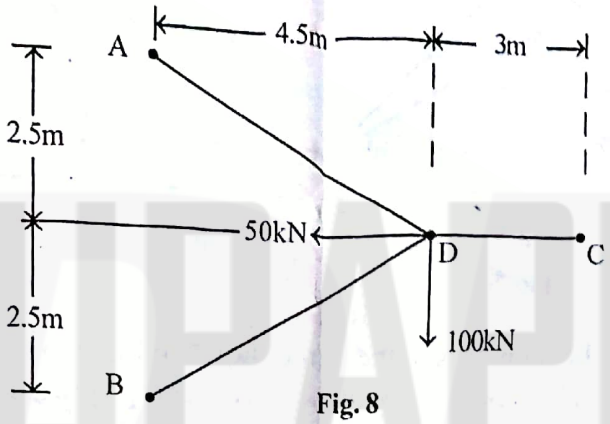


Fig. 8

OR

5. A building frame consists of three equal bays of 4m width and height of each storey is 4m. Find out wind moments, shears and direct forces in all columns and girders using portal method. Also mention the assumptions used in portal method fig.9. **(16)**

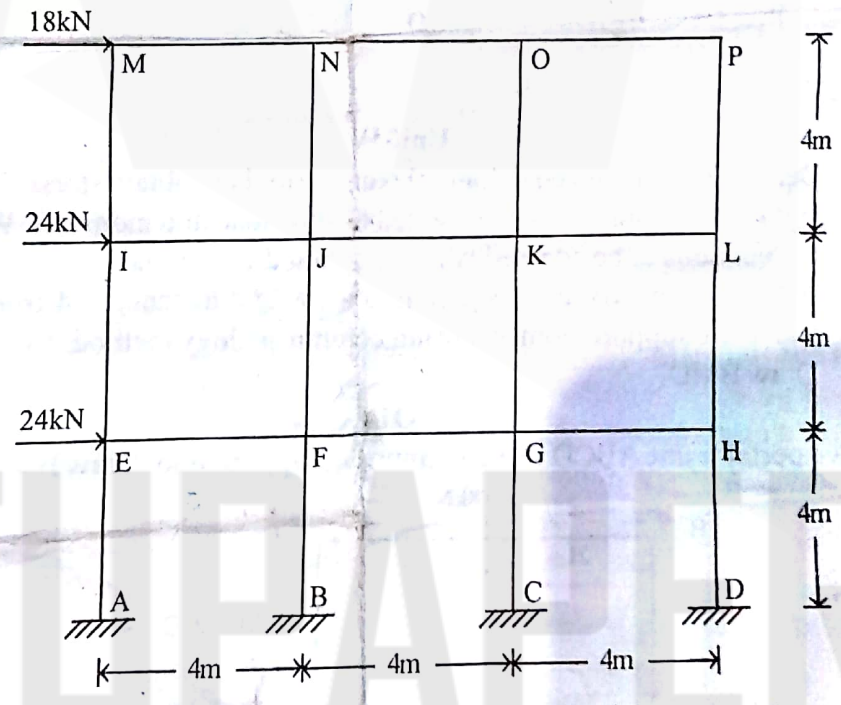


Fig.9