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P.E.S. College of Engineering, Mandya - 571 401

(An Autonomous Institution affiliated to VTU, Belagavi)

Sixth Semester, B.E. - Civil Engineering

Semester End Examination; June - 2017

Matrix Methods of Structural Analysis

Time: 3 hrs *Max. Marks: 100*

Note*: Answer **FIVE** full questions, selecting **ONE** full question from each Unit.*

UNIT - I

1. a State and explain the principles of minimum potential energy. 6

b. What are 'geometrical nonlinearity' and 'material non linearity' 6

c. Define strain energy. Obtain the strain energy stored in a member under bending. 8

2 a. State and explain Maxwell-Betti law of reciprocal displacements. 6

b. Outline the differences between flexibility method and stiffness method of matrix analysis. 8

c. A prismatic bar is subjected to an axial force as shown in Fig. Q2(c). Obtain the flexibility and stiffness of the bar. 6

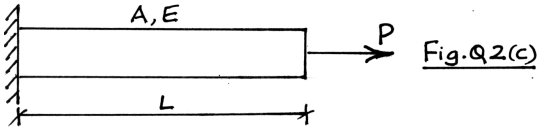

Fig.Q2(c)

UNIT - II

3. Find the forces in the pin-jointed plane truss shown in Fig. Q3 by force-transformation method. Assume AE to be constant for all members. 20

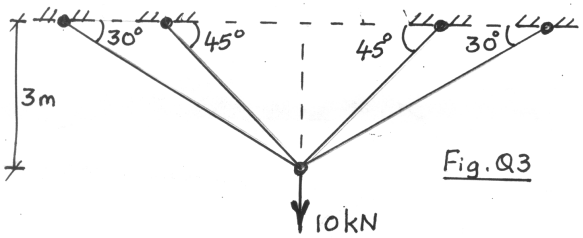

Fig. Q3

4. Analyse the continuous beam shown in Fig.Q4 by force-transformation method. Sketch BMD and elastic curve. 20

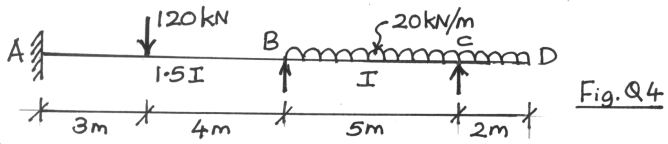

Fig. Q4

UNIT - III

5. Analyse the portal frame shown in Fig. Q5 by force-transformation method. Sketch BMD and elastic curve. 20

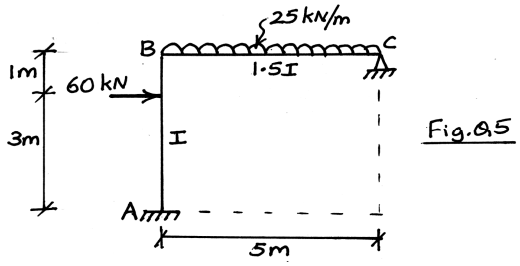

Fig. Q5

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6. Analyse the pin-jointed plane truss shown in Fig. Q6. By displacement- transformation method. Assume AE to be constant for all members. 20

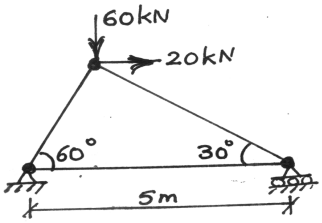

Fig. Q6

UNIT - IV

7. Analyse the continuous beam shown in Fig. Q7. By displacement-transformation method. Sketch BMD and elastic curve. 20

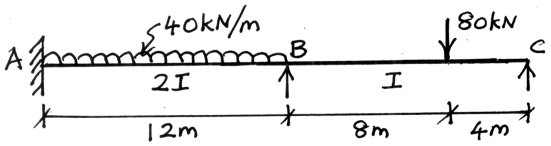

Fig. Q7

8. Analyse the portal frame shown in Fig.Q8 by displacement-transmission method. Sketch BMD and elastic curve. Assume EI to be same for all members. 20

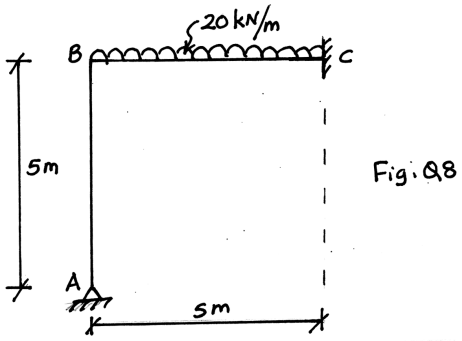

Fig. Q8

UNIT-V

9 a. Obtain the transformation matrix [T] of a plane truss member with usual notation. 6

b. Obtain structure stiffness matrix of the pin-jointed plane truss shown in Fig. 9(b) using direct stiffness method. Assume A = 2000 mm^2 and E = 200 GPa. For all members. 14

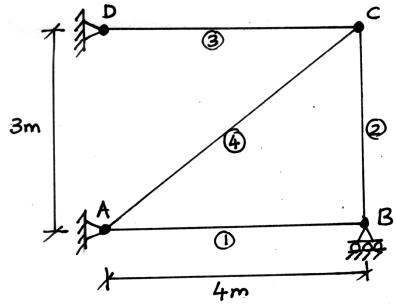

Fig 9(b)

10. Analyse the continuous beam shown in Fig.Q10 by direct stiffness method. Take; E = 20 GPa and I = $15x10^8$ mm^4 for all members. Sketch BMD and elastic curve. 20

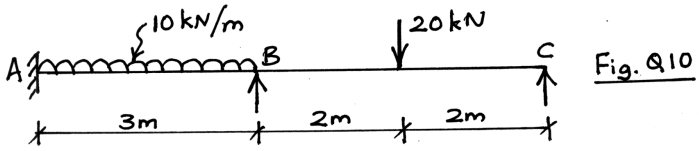

Fig. Q10

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