Reg. No. :

Question Paper Code: 41154

B.E. / B.Tech. DEGREE EXAMINATION, NOV 2016

Fifth Semester

Civil Engineering

14UCE504 – STRUCTURAL ANALYSIS - I

(Regulation 2014)

Duration: Three hours   Maximum: 100 Marks

Answer ALL Questions

PART A - (10 x 1 = 10 Marks)

1. Number of unknown internal forces in each member of a rigid jointed plane frame is

    (a) 1   (b) 2   (c) 3   (d) 6

2. A truss containing j joints and m members, will be a simple truss if

    (a) $m = 2j - 3$ (b) $m = 3j - 2$ (c) $j = 2m - 3$ (d) $j = 3m - 2$

3. Slope at a point in a beam is the

    (a) vertical displacement   (b) angular displacement
    (c) horizontal displacement   (d) none of these

4. Maximum slope in a simply supported beam with point load at center will be

    (a) at the supports   (b) at the center
    (c) in between the support and the center   (d) none of these

5. Distinction factor is the ratio of

    (a) relative stiffness / sum of relative stiffness at joint
    (b) carry over factor/sum of the factors
    (c) relative stiffness / flexural rigidity
    (d) none of these

6. In a far end hinged structure stiffness factor is

    (a) $K = 4EI/L$ (b) $K = 3EI/L$ (c) $K = 8EI/L$ (d) $K = 2EI/L$

7. Flexibility method in structural analysis is also known as

    (a) slope-deflection method   (b) moment-distribution method
    (c) consistent-deformation method   (d) stiffness method

8. The method of column analogy in structural analysis falls in the category of

    (a) displacement method   (b) stiffness method
    (c) flexibility method   (d) finite element method

9. Stiffness method in structural analysis is also known as

    (a) consistent-deformation method   (b) unit load method
    (c) force method   (d) displacement method

10. The stiffness method of structural analysis starts with

    (a) force-deformation method   (b) equilibrium of forces
    (c) compatible deformations   (d) structural stability

PART - B (5 x 2 = 10 Marks)

11. Distinguish between pin jointed and rigidly jointed structure.

12. Write the general slope deflection equation.

13. Define relative stiffness factor.

14. Define static indeterminacy.

15. What is a transformation matrix?

16. (a) Using the principle of virtual work, determine the vertical and horizontal deflection components of joint C of the truss in figure 1. $E = 200$ x 10^6 kN/m^2 and cross sectional area of each bar $= 150$ x 10^{-6} m^2. (16)
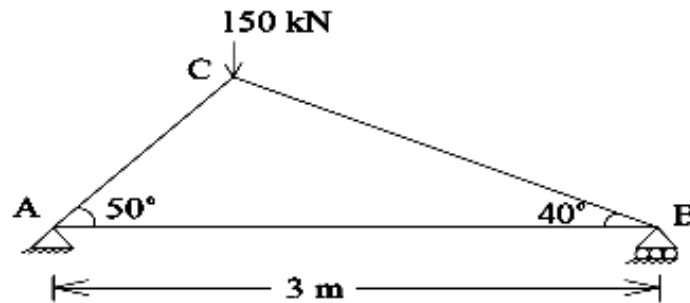
150 kN

C

A 50° 40° B

3 m

Figure 1

Or

(b) Using the method of virtual work, determine the horizontal displacement of a point C of the frame shown in figure 2. Take $E = 2$x10^5 N/mm^2, $I = 4$x10^6 mm^4. (16)

10 kN/m

B C

2.5 m

30 kN D 5 m

2.5 m

A 4 m
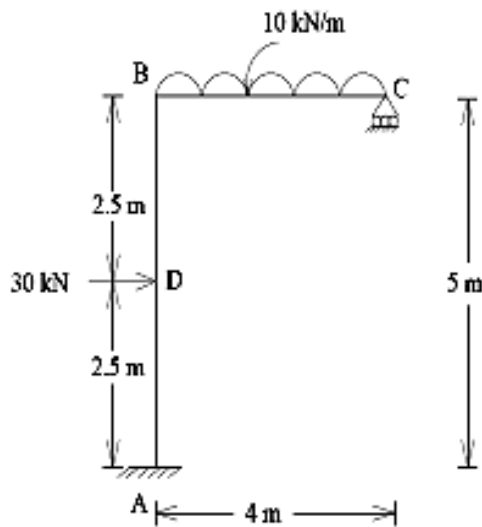
Figure 2

17. (a) Analyse the continuous beam loaded as shown in figure 3 by the slope deflection method and sketch the bending moment diagram, given: $2I_{AB} = I_{BC} = 2I_{CD} = 2I$. (16)

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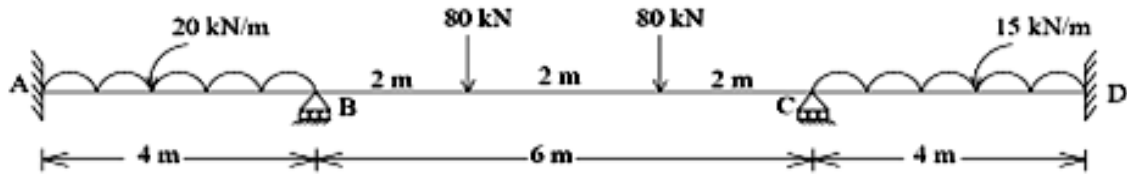
Figure 3

Or

(b) Analyse the portal frame loaded as shown in figure 4 by slope deflection method and sketch the bending moment and shear force diagrams. (16)
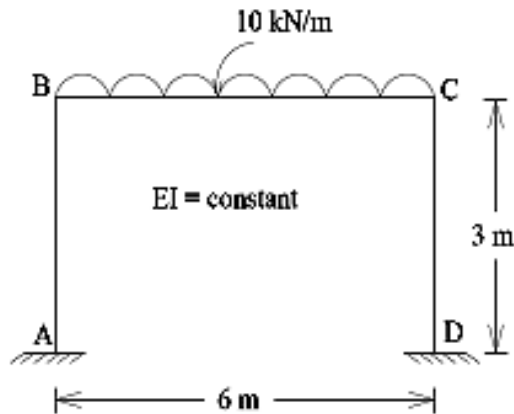

Figure 4

18. (a) Analyse the continuous beam loaded as shown in figure 5 by the method of moment distribution. Sketch the bending moment and shear force diagrams. (16)
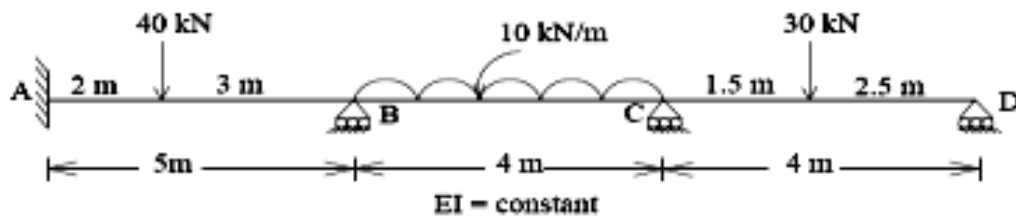

Figure 5

Or

(b) Analyse the structure loaded as shown in figure 6 by the moment distribution method and sketch the bending moment and shear force diagrams. (16)
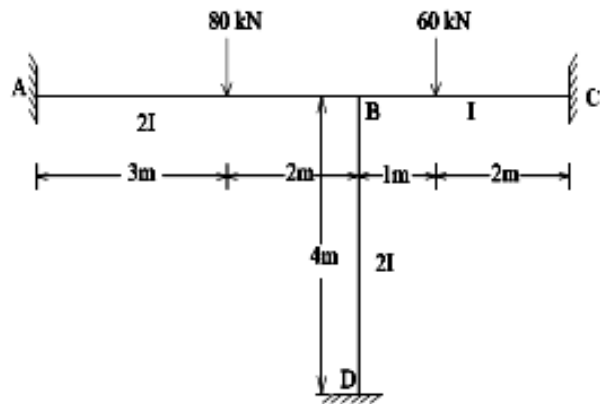
4

Figure 6

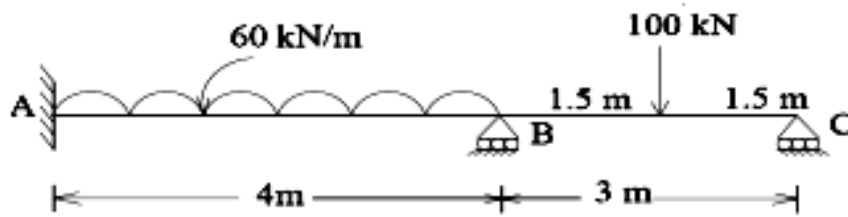19. (a) Analysis the continuous beam shown in figure 7 using flexibility matrix method. (16)

Figure 7

Or

(b) Analysis the pin-jointed plane frame shown in figure 8 by flexible matrix method. The members in parenthesis are cross-section areas of the members in mm^2. (16)
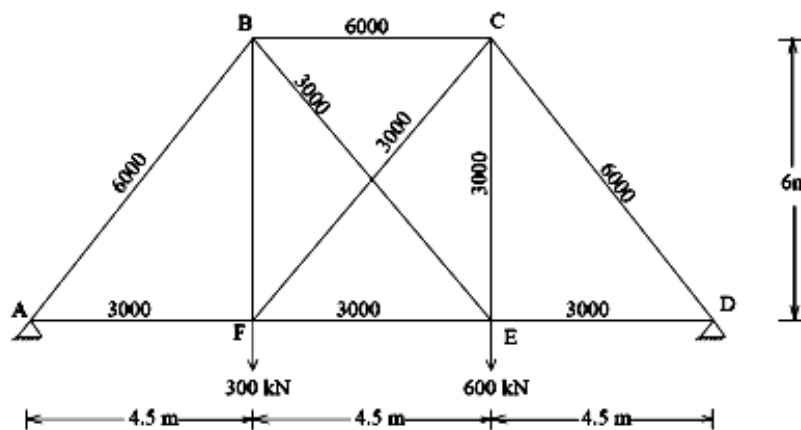

Figure 8

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20. (a) Analysis the continuous beam shown in figure 9 using stiffness matrix method. (16)

90 kN   80 kN/m   60 kN

A | 2 m   ↓   4 m   B ⌒⌒⌒⌒⌒ C   D
    2I   I   I
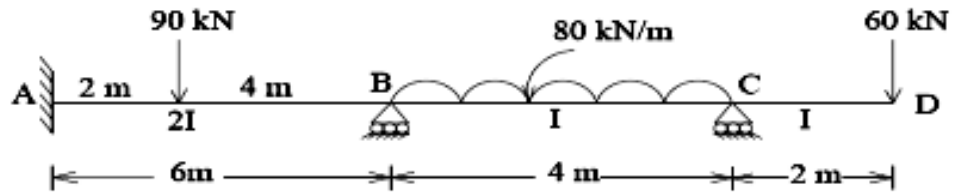|←——— 6m ———→|←——— 4 m ———→|←—2 m—→|

Figure 9

Or

(b) Using the stiffness matrix method, analysis the frame shown in figure 10. (16)

A   I   2I   C

B

1.6 m

120 kN →

3I
3.2 m

D

|←— 4 m —→|←——— 8 m ———→|

Figure 10

6

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