Code : 011616

B.Tech 6th Semester Exam., 2019

STRUCTURAL ANALYSIS—II

Time : 3 hours *Full Marks* : 70

Instructions :

(i) The marks are indicated in the right-hand margin.

(ii) There are ***NINE*** *questions in this paper.*

(iii) Attempt ***FIVE*** *questions in all.*

(iv) Question No. ***1*** *is compulsory.*

1. Choose the correct answer of the following (any *seven*) : 2×7=14

(a) If in a pin-jointed plane frame $(m+r)>2j$, then the frame is (where m is number of members, r is reaction components and j is number of joints)

(i) stable and statically determinate

(ii) stable and statically indeterminate

(iii) unstable

(iv) None of the above

(b) Principle of superposition is applicable, when

(i) deflections are linear functions of applied forces

(ii) material obeys Hooke's law

(iii) the action of applied forces will be affected by small deformations of the structure

(iv) None of the above

(c) The Castigliano's second theorem can be used to compute deflections

(i) in statically determinate structures only

(ii) for any type of structure

(iii) at the point under the load only

(iv) for beams and frames only

(d) When a uniformly distributed load, longer than the span of the girder, moves from the left to right, then the maximum bending moment at mid-section of span occurs when the uniformly distributed load occupies

(i) less than the left-half span

(ii) whole of left-half span

(iii) more than the left-half span

(iv) whole span

(e) When a load crosses a through-type Pratt truss in the direction left to right, the nature of force in any diagonal member in the left-half of the span would

(i) change from compression to tension

(ii) change from tension to compression

(iii) always be compression

(iv) always be tension

(f) Which of the following methods of structural analysis is a force method?

(i) Slope deflection method

(ii) Column analogy method

(iii) Moment distribution method

(iv) None of the above

(g) For a two-hinged arch, if one of the supports settles down vertically, then the horizontal thrust

(i) is increased

(ii) is decreased

(iii) remains unchanged

(iv) becomes zero

(h) The deflection at any point of a perfect frame can be obtained by applying a unit load at the joint in

(i) vertical direction

(ii) horizontal direction

(iii) inclined direction

(iv) the direction in which the deflection is required

(i) Stiffness matrix method is applicable to the structures

(i) static indeterminacy > kinematic indeterminacy

(ii) static indeterminacy < kinematic indeterminacy

(iii) Both (i) and (ii)

(iv) None of the above

(j) While using three-moment equation, a fixed end of a continuous beam is replaced by an additional span of

(i) zero length

(ii) infinite length

(iii) zero moment of inertia

(iv) None of the above

2. *(a)* Analyze the built-up beam of length L carries a point load W kN at distance a from the left end and b from the right end by conjugate method. Assume EI = constant. 7

(b) A two-hinged rectangular portal frame $ABCD$, hinged at A and D. The height and the span length is L. It carries a UDL of intensity w kN/m over whole span length. Find the horizontal thrust at supports by strain energy method. Assume EI = constant. 7

3. Determine support moments by moment distribution method and draw the bending moment and shear force diagram of a beam as shown in Fig. 1 below. EI is constant for all members : 14

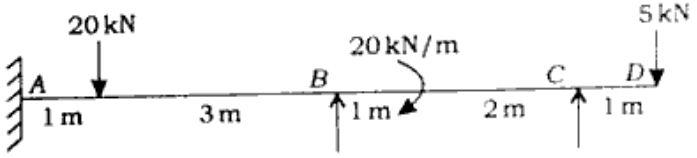

Fig. 1

4. Analyze the rigid frame as shown in Fig. 2 below by slope deflection method and draw the bending moment diagram : 14

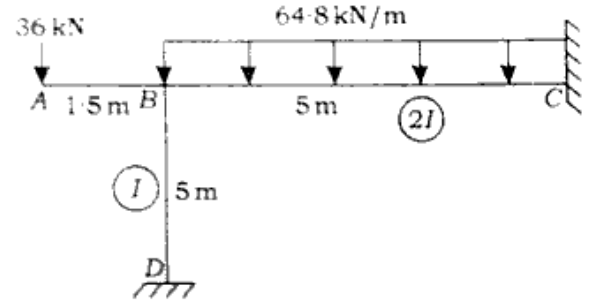

Fig. 2

5. *(a)* Describe effect of finite joints and their applications to plane and space framed structures. 7

(b) Analyze a continuous beam having two spans AB and BC of lengths 6 m and 8 m by three-moment equation. The span AB carries a point load of intensity 30 kN at a distance 2 m from left support A and span BC carries UDL of intensity 20 kN/m over whole span. Also draw the shear force and bending moment. EI is constant for both the spans. 7

6. Solve the problem by stiffness matrix method and draw the shear force and bending moment of the beam as shown in Fig. 3 below : 14

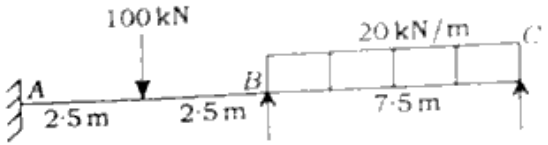

Fig. 3

7. *(a)* Write various softwares' name used for structural analysis. Describe any one, step-by-step, for the analysis of structures. 7

(b) A propped cantilever beam of length L carries a point load W at the centre of beam. Analyze the beam by method of consistent deformation and draw the shear force and bending moment. EI is constant throughout the span. 7

8. *(a)* A two-hinged parabolic arch is of span 20 m and rise 10 m. Draw the influence line diagram for horizontal thrust and bending moment at a section 8 m from the left support due to movement of 100 kN load from the left to right. 7

(b) Describe the procedure involved in finite element method. Write the advantages, disadvantages and applications of FEM. 7

9. *(a)* Prove that flexibility matrix and stiffness matrix are inversely proportional to each other. Write the advantages of the matrix method over other methods of analysis of structures. 7

(b) A two-hinged parabolic arch of span L and rise h carries a point load W at the crown of arch. Show that the horizontal thrust equals $25WL/128h$ at each support. 7

★ ★ ★