

**Code : 011616**

**B.Tech 6th Semester Examination, 2017**

**Structural Analysis-II**

**Time : 3 hours**

**Full Marks : 70**

**Instructions :**

- (i) There are Nine Questions in this Paper.
- (ii) Attempt Five questions in all.
- (iii) Question No. 1 is Compulsory.
- (iv) The marks are indicated in the right-hand margin.

1. Answer any seven questions from this multiple choice type question. 2×7=14

- (i) Due to same point load anywhere on a fixed beam, the maximum free bending moment is  $M$ . The sum of fixed end moments is
  - (a)  $M$
  - (b)  $1.5M$
  - (c)  $2M$
  - (d)  $3M$
- (ii) A propped cantilever beam of span  $L$ , is loaded with uniformly distributed load of intensity  $w$ /unit length, all through the span. Bending moment at the fixed end is
  - (a)  $wL^2/2$

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- (b)  $wL^2/8$
- (c)  $wL^2/12$
- (d)  $wL^2/24$

(iii) A two hinged semicircular arch of radius ' $R$ ' carries a concentrated load  $W$  at the crown

- (a)  $\omega / 2\pi$
- (b)  $2\omega / 3\pi$
- (c)  $\omega / \pi$
- (d)  $4\omega / 3\pi$

(iv) The ratio of the stiffness of a beam at the near end when the far end is hinged to the stiffness of the beam at near end and when the far end is fixed is

- (a)  $1/2$
- (b)  $1$
- (c)  $4/3$
- (d)  $3/4$

(v) Degree of kinematic indeterminacy of a pin-jointed plane frame is given by

- (a)  $2j-r$
- (b)  $j-2r$
- (c)  $3j-r$
- (d)  $2j+r$

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- (vi) If in a rigid-jointed space frame,  $(6m+r) < 6j$ , then the frame is
- Unstable
  - stable and statically determinate
  - stable and statically indeterminate
  - None of the above
- (vii) In moment distribution method, the sum of distribution factors of all the members meeting at any joint is always.
- Zero
  - less than 1
  - 1
  - greater than 1
- (viii) For a two-hinged arch, if one of the supports settles down vertically, then the horizontal thrust
- is increased
  - is decreased
  - becomes zero
  - remains unchanged
- (ix) Shape function is used in which method of structural analysis
- Conjugate beam method
  - Finite element method
  - Slope-deflection method

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- Consistent deformation method
- (x) Which of the following software is not related to structural analysis?
- SAP 2000
  - Sky Civ
  - SAFI
  - ArcGIS
2. A beam AB of span L is fixed at A and freely supported at B. For the left half AC the moment of inertia of the section is  $2I$ , while for the right half it is  $I$ . A clockwise couple  $M_0$  is applied at the end B. Find the prop reaction and the slope at this end. Find also the B.M. at the fixed end. Use conjugate beam method. 14
3. Compute the ordinates at intervals of 2 m of the influence line for B.M. at the mid-span of span BC for the continuous beam shown in fig. The beam has uniform moment of inertia throughout its length. 14

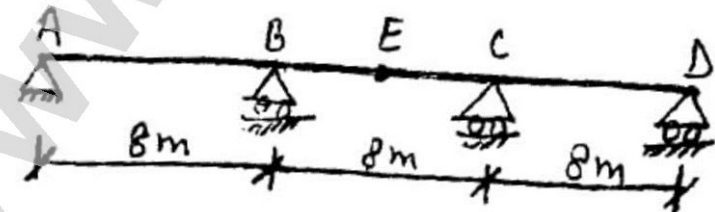


Fig.1

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4. A two-hinged parabolic arch of span  $l$  and rise  $h$  carries a concentrated load  $W$  at a distance  $a$  from the left end. Show that the horizontal thrust at each support is given by

$$\frac{5}{8} \cdot \frac{W}{hl^3} \sin(l-a)(l^2 + la - a^2).$$

5. Analyze the frame shown in fig and draw B.M. diagram. Use Slope deflection method.

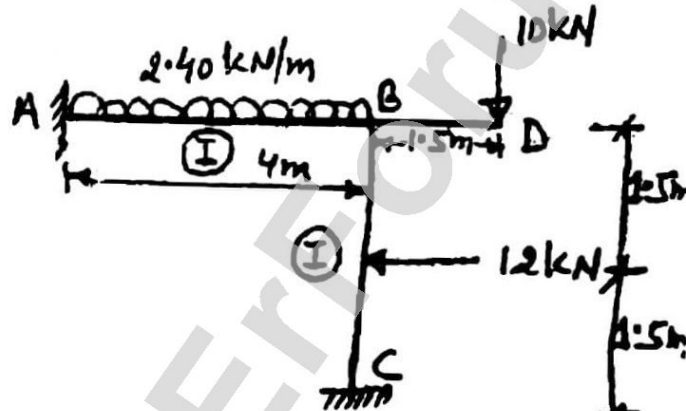


Fig. 2

6. ABCD is a portal frame subjected to a horizontal load of 30 kN/m acting uniformly on the vertical column AB. The supports at A and D are hinged as shown in Fig.3 Analyze the frame in sway condition, using moment distribution method. All members have the same flexural rigidity.

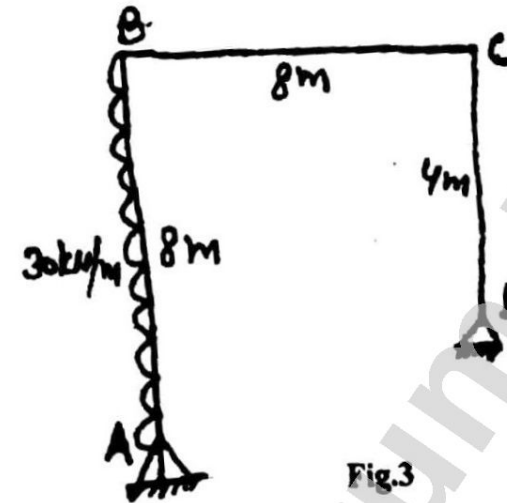


Fig.3

7. Find the vertical and horizontal deflection at A for the lamp post loaded as shown in fig.4 using energy method. Assume uniform flexural rigidity.

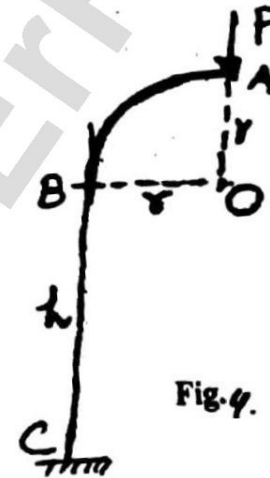


Fig.4.

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8. Generate the stiffness matrix for the rigid jointed frame with respect to the coordinates shown in fig.5. 14

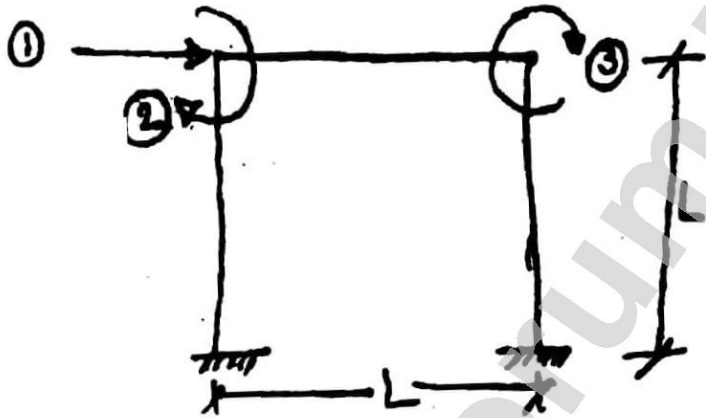


Fig. 5.

9. What do you mean by Finite element method ? Discuss the steps adopted for analysing a structural problem by the finite element method. 14

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