

Total No. of Questions—8]

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[5057]-209**S.E. (Civil) (Second Semester)****EXAMINATION, 2016****STRUCTURAL ANALYSIS—I****(2012 PATTERN)****Time : Two Hours****Maximum Marks : 50**

N.B. :— (i) Answer Q. No. 1 or Q. No. 2, Q. No. 3 or Q. No. 4, Q. No. 5 or Q. No. 6, Q. No. 7 or Q. No. 8.

(ii) Neat sketches must be drawn wherever necessary.

(iii) Figures to the right indicate full marks.

(iv) Assume suitable data, if necessary.

(v) Use of electronic pocket calculator.

(vi) Use of cell phone is prohibit in the examination hall.

1. (a) State and explain static and kinematic indeterminacy. Determine the static and kinematic indeterminacy for the beam shown in Fig. 1 b. [6]

(b) Analyse the continuous beam loaded and supported as shown in Fig. 1 b by three moment theorem. Assume uniform flexural rigidity. [6]

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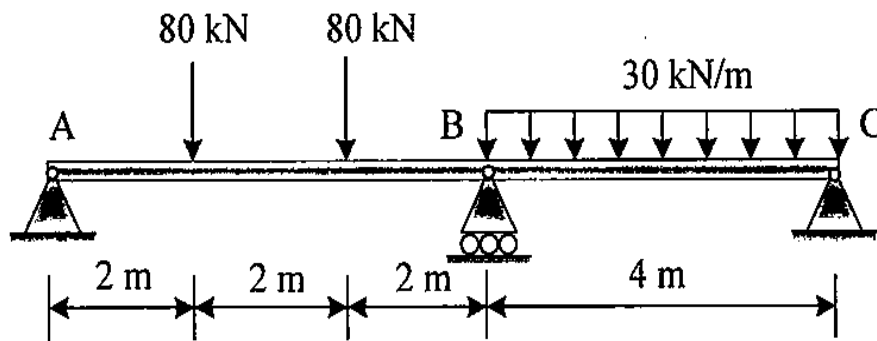


Fig. 1 b

Or

2. (a) Find slope and deflection for the cantilever AB of span 2 m loaded with uniformly distribution load 10 kN/m up to 1 m from end A by moment area method. Assume uniform flexural rigidity. [6]
- (b) A portal frame ABCD has hinged ends at A and D with rigid joints B and C. The columns AB and CD are 4 m height. The beam BC is 4 m long and carries a uniformly distributed load 30 kN/m. Find the horizontal reaction at A by strain energy method. [6]
3. (a) Find the vertical displacement of joint C for the pin jointed truss as shown in Fig. 3 a. The cross-sectional area of the members AD, DB and CD is 150 mm^2 and the areas of the members AC and BC are 200 mm^2 each.

Take $E = 200 \text{ kN/mm}^2$. [6]

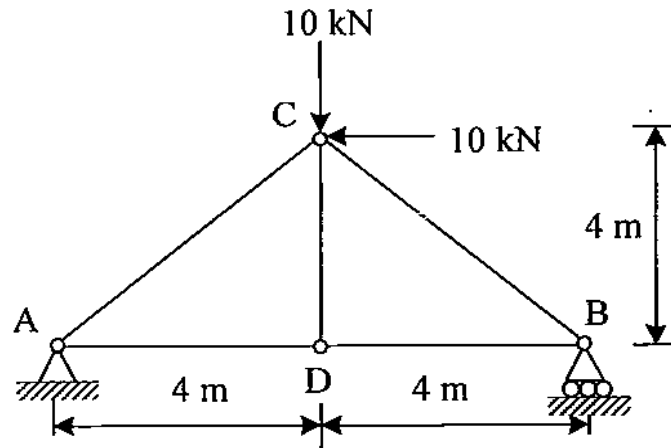
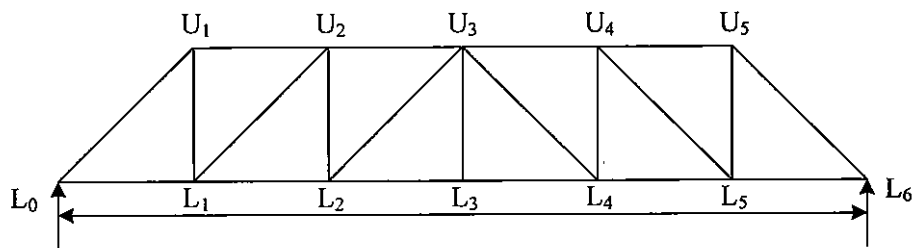


Fig. 3 a

- (b) Draw influence line diagrams for forces in the members U_2 , U_3 , L_2U_3 and L_2L_3 of the through type bridge truss of height 3 m as shown in Fig. 3 b. [6]



6 panels of 4 m each = 24 m

Fig. 3 b

Or

4. (a) Determine maximum shear and moment by influence line method for a simply supported beam of span 4 m loaded with uniformly distributed load of 10 kN/m on whole span. [6]
- (b) Two pin jointed rods AC and BC are hinged to a rigid ceiling at points A and B, 2.5 m apart. AC is 2 m long and makes a right angle to BC. If a vertical bar DC, hinged at C and to the ceiling at D is added, calculate the force in the three members when a load of 10 kN is suspended from C. All three rods have the same cross sectional area. [6]

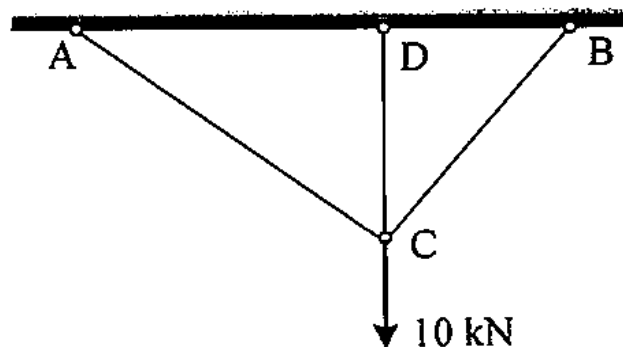


Fig. 4 b

5. (a) The equation of a three hinged parabolic arch with origin at its left support is $y = x - (x^2/40)$. The span of the arch is 48 m. The arch is carrying a uniformly distributed load 20 kN/m over left half of the span. Determine the horizontal reaction at the supports. [6]

- (b) A two hinged parabolic arch of span 25 m and central rise 5 m is subjected to point load 60 kN from left support at distance of 5 m. Determine the normal and horizontal thrust. Also find bending moment under the point load. [7]

Or

6. (a) A circular arched rib of 20 m span with central rise of 4 m is hinged at the crown and springing. It carries a point load of 125 kN at 7.5 m from the left hand hinge. Calculate the horizontal thrust of the arch, the reactions at the supports and the maximum positive BM. [6]
- (b) A two hinged semicircular arch of radius 10 m is subjected to uniformly distributed load 12 kN/m on the right half of the arch. Determine the horizontal thrust and reaction at supports. [7]
7. (a) Explain in brief equal area axis, plastic section modulus and shape factor for rectangular cross section of width b and depth d . [6]
- (b) A beam of span L fixed at one end and hinged at other end is loaded with uniformly distributed ultimate load w_u . Find the collapse load for the beam if the plastic moment of resistance of the section is M_p . [7]

Or

8. (a) Explain in brief stress distribution for elastic, elasto-plastic and plastic section. [6]
- (b) A propped cantilever beam is subjected to a concentrated load W at the centre. Determine the collapse load for the beam. [7]

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