Total No. of Questions—**8**] [Total No. of Printed Pages—**5**

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# [5352]-109

## S.E. (Civil) (II Sem.) EXAMINATION, 2018

## STRUCTURAL ANALYSIS I

## (2012 PATTERN)

**Time : Two Hours** **Maximum Marks : 50**

***N.B.*** :— (*i*) Answer Q. **1** or Q. **2**, Q. **3** or Q. **4**, Q. **5** or Q. **6** and Q. **7** or Q. **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 is permitted.

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

**1.** (*a*) Determine maximum slope and deflection for the simply supported beam AB of span 4 m loaded with uniformly distributed load 20 kN/m over a whole span. Assume uniform flexural rigidity. [6]

(*b*) A fixed beam of span 10 m subjected to point load 30 kN at 4 m from left support. Determine fixed end moments and draw bending moment diagram. [6]

*Or*

**2.** (*a*) Define conjugate beam and explain characteristics of conjugate beam. [6]

P.T.O.

(*b*) A beam ABC has fixed end at A and C. The beam AB of span 4 m subjected to central point load of 10 kN and beam BC is 3 m long carries a uniformly distributed load 30 kN/m. Analyse the beam using Clapeyron's theorem and draw bending moment diagram. [6]

**3.** (*a*) Find the vertical displacement of joint D for the pin jointed truss as shown in Fig. 1. The cross-sectional area of the members AD, DB and CD is 1500 $mm^2$ and the areas of the members AC and BC are 2000 $mm^2$ each.

Take E = 200 $kN/mm^2$. [6]

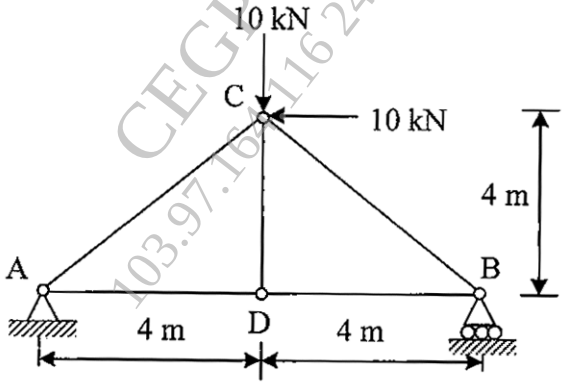


**Fig. 1**

(*b*) Draw influence line diagrams for forces in the members $L_1L_2$, $L_2U_3$ and $U_4U_5$ of the through type bridge truss as shown in Fig. 2. Height of truss is 4 m. [6]

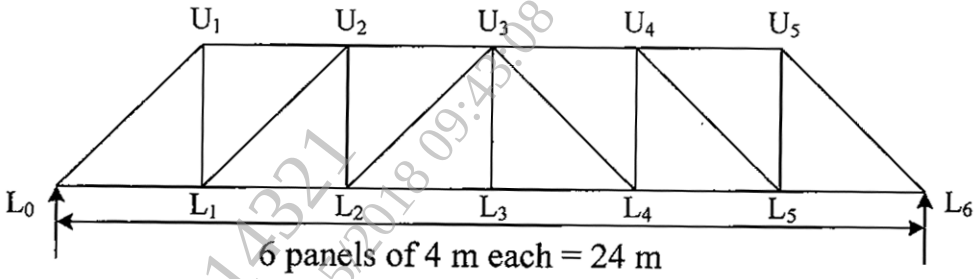


**Fig. 2**

*Or*

**4.** (*a*) Determine maximum shear and moment by influence line method for a simply supported beam of span 5 m with overhang of 1.5 m on either side and loaded with uniformly distributed load 50 kN/m on entire span. [6]

(*b*) Two pin jointed rods AC and BC are hinged to a rigid ceiling at point 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. Refer Fig. 3. [6]

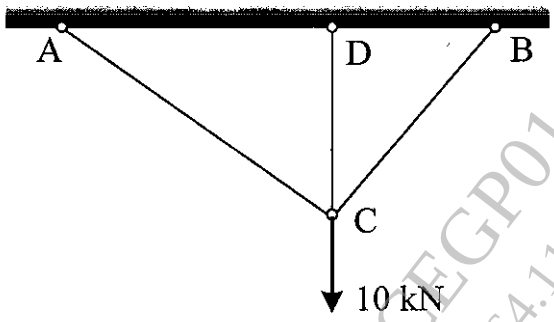


**Fig. 3**

**5.** (*a*) A two hinged parabolic arch of span L and rise *h* subjected to a uniformly distributed load *w* kN/m on entire span. Determine horizontal thrust of the arch. [6]

(*b*) A three hinged circular arch of span 40 m and rise 10 m is subjected to uniformly distributed load 20 kN/m on the left half of the arch. Determine the horizontal thrust, normal thurst, radial shear and bending moment at 5 m from left hinge. [7]

*Or*

**6.** (*a*) A three hinged circular arch of span 30 m and rise 6 m carries point load 15 kN at crown and uniformly distributed load 10 kN/m on entire span. Determine reaction at supports, normal thrust and radial shear at quarter span. [6]

(*b*) A two hinge parabolic arched rib of 25 m span with central rise of 5 m is hinged at the springing. It carries a point load of 125 kN at 7.5 m from the left hand hinge and uniformly distributed load of 10 kN/m over a left half span. Calculate the reactions at the supports and the maximum positive BM. [7]

**7.** (*a*) A beam (I section) having both flanges 200 × 20 mm and web 400 × 10 mm, if permissible yield stress is tension and compression is 250 MPa, determine shape factor. [6]

(*b*) Determine plastic moment of resistance for a simply supported beam of span 10 m subjected to uniformly distributed load of 20 kN/m on entire span. [7]

*Or*

8. (*a*) Explain types of possible mechanisms in plastic analysis of frame with example. [6]

(*b*) A fixed beam is loaded and supported as shown in Fig. 4. Calculate the collapse load for the beam if the plastic moment of resistance of the uniform section of the beam is 50 kNm. [7]

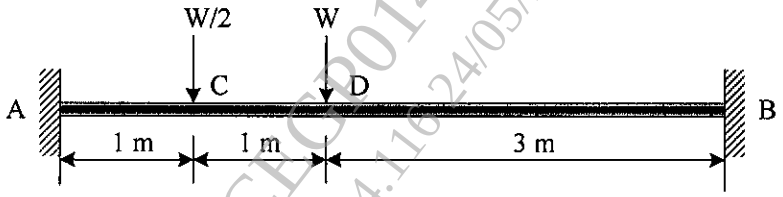


**Fig. 4**