

Total No. of Questions—8]

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**[5152]-109****S.E. (Civil) (II Sem.) EXAMINATION, 2017****STRUCTURAL ANALYSIS—I****(2012 COURSE)****Time : Two Hours****Maximum Marks : 50**

**N.B. :-** (i) Attempt 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 prohibited in the examination hall.

1. (a) Define static and kinematic indeterminacy. Determine the static and kinematic indeterminacy for propped cantilever. [6]
- (b) Determine moment at B for the continuous beam loaded and supported as shown in Fig. 1 by three moment theorem. Assume uniform flexural rigidity : [6]

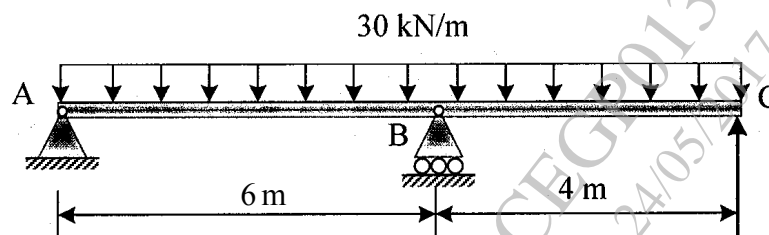


Fig. 1

P.T.O.

Or

2. (a) Find maximum slope and deflection for the cantilever AB loaded with uniformly distributed load 6 kN/m on entire 2 m span 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 central point load 100 kN. Find the horizontal reaction at B by strain energy method. [6]
3. (a) Find the vertical displacement of joint C for the pin jointed truss as shown in Fig. 2. The cross sectional area of the members AC and CB are  $800 \text{ mm}^2$  and the areas of the members AB is  $1000 \text{ mm}^2$ . Take  $E = 200 \text{ kN/mm}^2$ . [6]

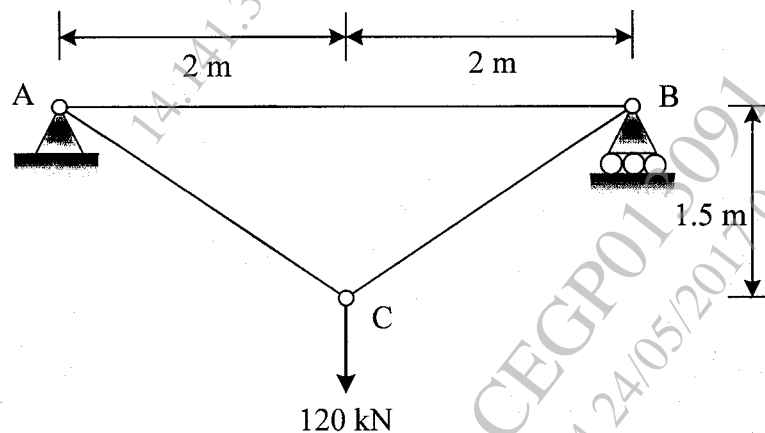


Fig. 2

- (b) Draw influence line diagrams for forces in the members  $U_2U_3$ ,  $L_2U_3$  and  $L_2L_3$  of the through type bridge truss of height 4 m as shown in Fig. 3 : [6]

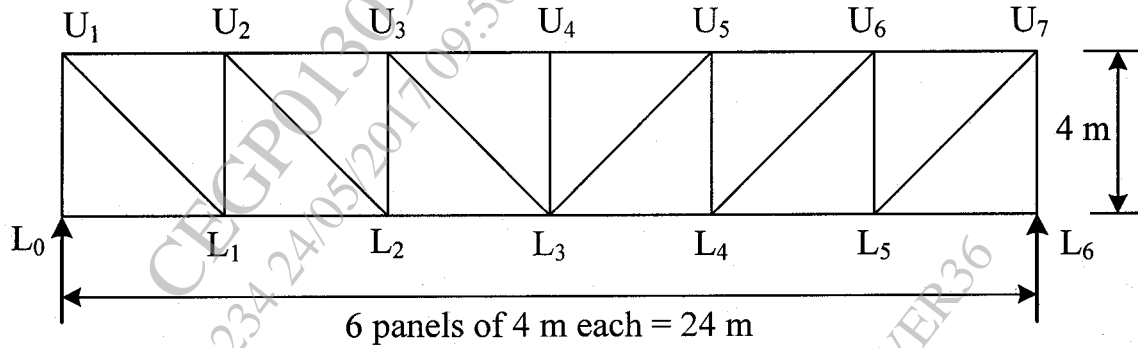


Fig. 3

Or

4. (a) Determine support reaction and maximum bending moment by influence line method for a simply supported beam of span 4 m loaded with central point load 50 kN. [6]
- (b) Find forces in members of the truss as shown in Fig. 4. Cross-sectional area and material of all members is same : [6]

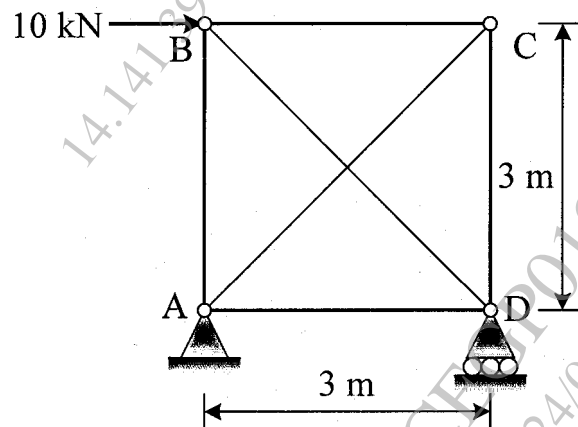


Fig. 4

5. (a) A three hinged parabolic arch, hinged at crown and springing has a horizontal span of 12 m and central rise of 2.5 m. It carries a uniformly distributed load of 30 kN per horizontal meter run over the left hand half of the span. Determine the reaction at the end hinges. [6]
- (b) A two hinged semicircular arch of uniform section is hinged at abutments which are at the same level. It carries a point load  $W$  at the crown. Show that the horizontal thrust at the abutment is  $W/\pi$ . [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 100 kN at 5 m from the left hand hinged. Determine the reaction at the supports. [6]
- (b) A parabolic arch rib of span 30 m and central rise 6 m is hinged at the ends. It carries a uniformly distributed load 20 kN per horizontal meter run over 12 m from the left hinge towards the centre. Determine the horizontal thrust. [7]
7. (a) Draw stress distribution for elastic, elasto-plastic and plastic stage. [6]

- (b) A beam of span  $L$  fixed at one end and hinged at other end is loaded with central point load  $W$ . Find the collapse load for the beam if the plastic moment of resistance of the section is  $M_p$ . [7]

*Or*

8. (a) State and explain concept of plastic hinge and collapse mechanism with suitable example. [6]
- (b) A propped cantilever is subjected to a uniformly distributed load  $w$  per unit length on entire span. Determine the collapse load for the beam. [7]

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