19.5.06

Ex/BESUS/CE-601/06

B.E. (CE) Part-III 6th Semester Examination, 2006

Theory of Structures II
(CE-601)

Time : 3 hours   **Full Marks : 100**

Use separate answerscript for each half.
Answer SIX questions, taking THREE from each half.
Two marks are reserved for neatness in each half.

FIRST HALF

1. A curved beam is in the form of a full continuously circle in plan with a radius of 4m and is supported continuously on six supports. The beam carries a uniformly distributed load, of 2kN/m length, inclusive of its own weight. Starting from the 1st principle, derive the generalized expressions, for support moment, shear force and bending moment at any section in curved beam. Determine the values of shear force and bending moment at salient locations and plot S.F. and B.M. diagram.   [16]

2. Explain the principles of Column Analogy method. Calculate the fixed end moments of a fixed ended beam subjected to uniformly distributed load w/unit length by column Analogy method. Using column analogy method, also derive the stiffness and carry over factors for a beam with far end fixed and another beam with far end hinged. Consider the flexural rigidity to be EI uniformly in all cases.   [16]

3. Draw the influence line diagrams for support reactions R_A and R_B at the end support A and middle support B, respectively, of a two span continuous beam ABC which is supported by a hinge at A and by rollers at B and C, respectively. The beam has two equal spans, each of length *l* and a uniform flexural rigidity EI throughout its length.   [16]

4. Analyze the portal frame shown in Fig.Q.4 by moment distribution method.
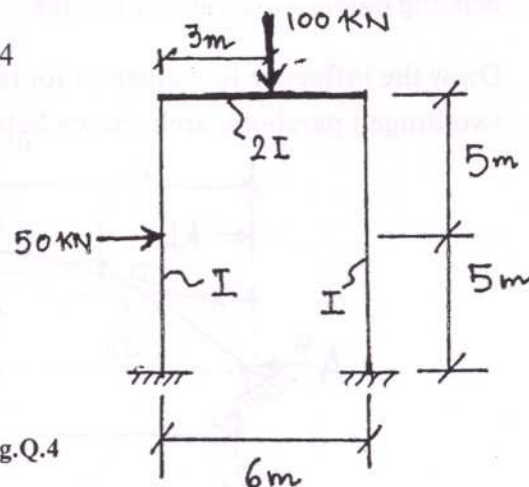
    Draw the bending moment diagram.

Fig.Q.4

(CE-601)

5. Answer <u>any four</u> from the following : [4×4]

a) State whether the following methods are force method or displacement method :
(i) Slope deflection method (ii) Column analogy method (iii) Moment distribution method (iv) Conjugate beam method.

b) State the difference between the nature of the internal forces or moments developed in any section of an arch and a beam curved in plan under vertical loading.

c) Draw the influence line diagram for the shear force at a section having a distance $l/3$ from the left hand support of a simply supported beam of span l.

d) Explain how joint rotations can be calculated from the results of moment distribution method.

e) Define degrees of freedom and degrees of redundancy of a structure explaining the difference between two.

SECOND HALF

6. A two-hinged parabolic arch of span 30m and rise 6m has the second moment of area varying as the secant of the angle of slope of the rib axis. The arch is subjected to u.d.l. of 20 kN/m over the entire span and a point load of 100 kN at a distance of 6m from the left hand support. Determine the horizontal thrust at the supports and the position and magnitude of maximum bending moments of either nature. Explain how the values of the maximum bending moments would be affected if the supports yield horizontally.

7. The shape of a link in a chain consists of two semi-circles joined by two straight portion and having same cross-section throughout as shown in Fig.Q.7. If the link is subjected to a pull W as shown, draw the complete bending moment diagram for the link
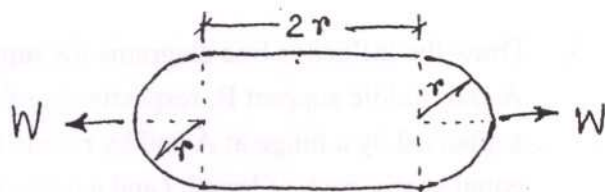

Fig.Q.7

8. Draw the influence line diagram for radial shear and bending moment at D for the two hinged parabolic arch shown below. Take $I = I_C$ see α.
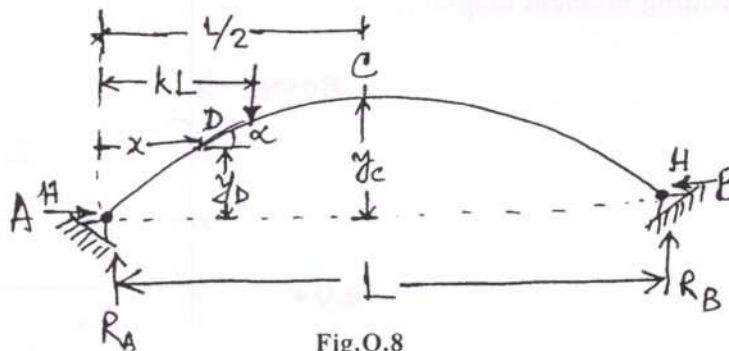

Fig.Q.8

(CE-601)

9. Analyse the box culvert applying stope deflection method as show in Fig.Q.9.
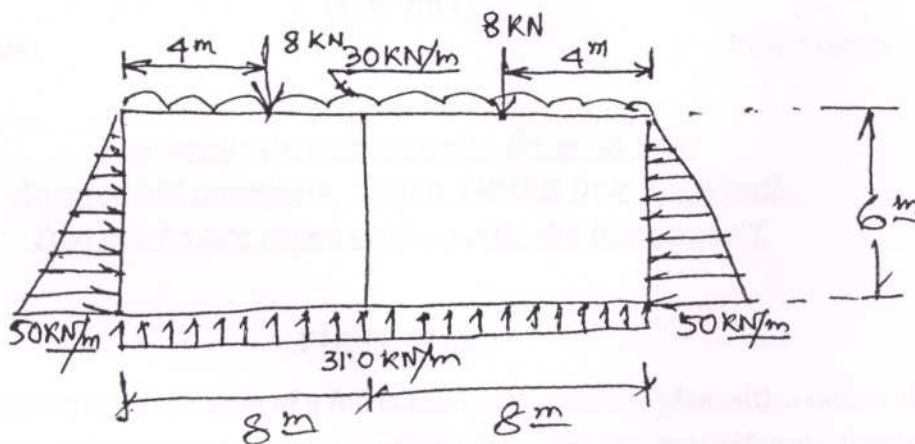

Fig.Q.9

10. Determine the forces in all the members of the pin-jointed plane truss on a hilly slope pulled by a cable with a force of 150 kN at A as shown in Fig.Q.10. The members have same cross-sectional area.
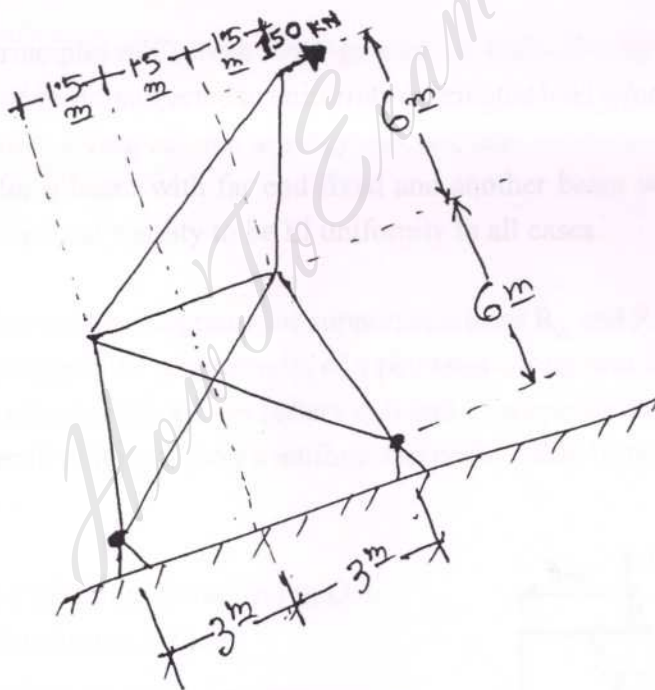

Fig.Q.10

— — —