Total No. of Questions : 10] [Total No. of Printed Pages : 5

Roll No. .....

CE–505(O)

B. E. (Fifth Semester) EXAMINATION, Dec., 2009

(Old Scheme)

(Civil Engg. Branch)

THEORY OF STRUCTURE – I

[CE – 505(O)]

Time : Three Hours

Maximum Marks : 100

Minimum Pass Marks : 35

Note : Attempt all the *five* questions. All questions carry equal marks. Assume suitable data if required and state them clearly.

1. (a) State and explain the principle of virtual work. How can it be used to find the displacements at nodes in trusses ? 10

   (b) Applying the energy principle, find the displacement at the tip of the cantilever shown below : 10

(EI constant)

Fig. 1

P. T. O

Or

2. In the figure shown below find the vertical displacement of joint C under the applied loading for the truss :

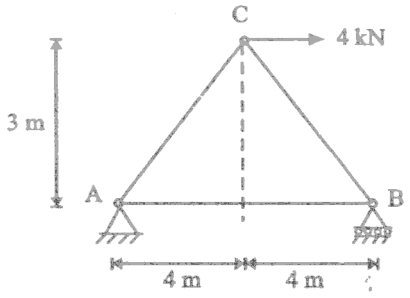

Fig. 2

The cross-sectional area of each member of the truss is $A = 400\ mm^2$ and $E = 200\ GPa$.

If no-load acts on the truss, what would be the vertical displacement of joint C if the members AB were 5 mm too short. 20

3. (a) Explain static and kinematic indeterminacy with the help of an example of your own. 5

(b) Analyse the beam shown below by the theorem of three moments : 15

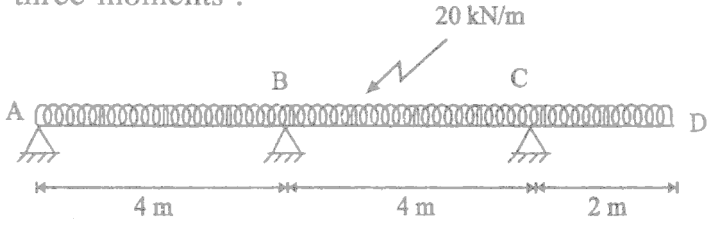

Fig. 3

Or

4. (a) Justify that the Moment Distribution method is a displacement method. 5

(b) Analyse the beam shown below by Moment Distribution method. Given that EI is constant. 15

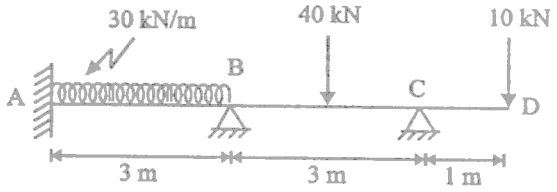

Fig. 4

5. Compute the reactions and draw the bending moment diagram for the prismatic beam shown below by Slope Deflection method : 20

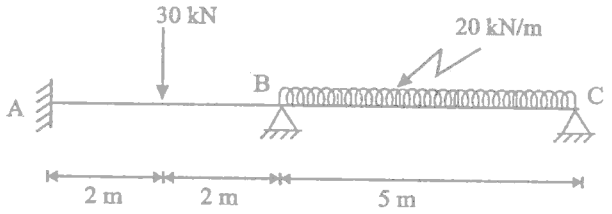

Fig. 5

Or

6. Determine the fixed-end moments for the prismatic beam shown below by the column-analogy method : 20

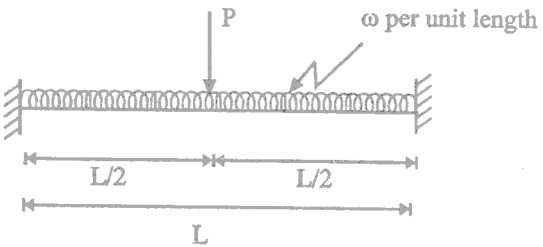

Fig. 6

7. (a) State and explain Eddy's theorem. 5

(b) A three hinged segmental arch has a span of 50 m and a rise of 8 m. A 100 kN load is acting vertically at a

point 15 m measured horizontally from the right hand support.

Find :

(i) The horizontal thrust H, developed at the supports.

(ii) The moment, normal thrust and radial shear at a section 15 m from the left hand support. 15

Or

8. Determine the tension in each segment of the cable shown in figure below. Also find the dimension *h*. 20

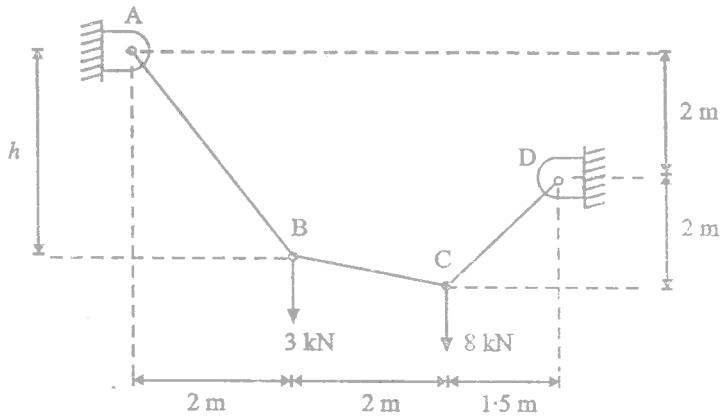

Fig. 7

9. (a) What are the influence lines and what for they need to be drawn in structural analysis ? 5

(b) For the beam shown, draw the influence line for : 15

(i) Reaction R_A at A

(ii) Shear force at mid span point C

(iii) Bending moment at C

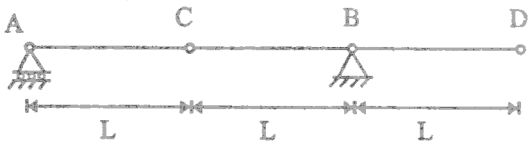

Fig. 8

Or

10. The span of a girder is 10 m. The live load system shown in figure below may cross the span in either direction. Determine the maximum bending moment in the girder and obtain the equivalent uniformly distributed loading to cause the same value of the maximum bending moment. Draw the influence line for shear at the left hand quarter point and calculate the maximum value. 20

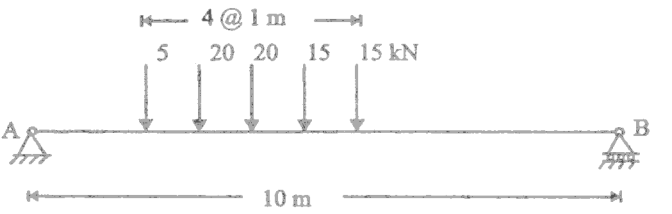

Fig. 9