Total No. of Questions : 5] [Total No. of Printed Pages : 4

Roll No. .....

CE–505

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

(Civil Engg. Branch)

THEORY OF STRUCTURES – I

(CE – 505)

Time : Three Hours

Maximum Marks : 100

Minimum Pass Marks : 35

Note : Answer all questions. Assume suitable missing/misprint data if required. It should be clearly stated.

1. (a) What do you understand by strain energy and complementary energy ? 4

   (b) Determine the vertical and horizontal deflection at the free end of the frame shown in fig. 1. Given $E = 200\ kN/mm^2$ and $I = 30 \times 10^6\ mm^4$. Use strain energy method. 16

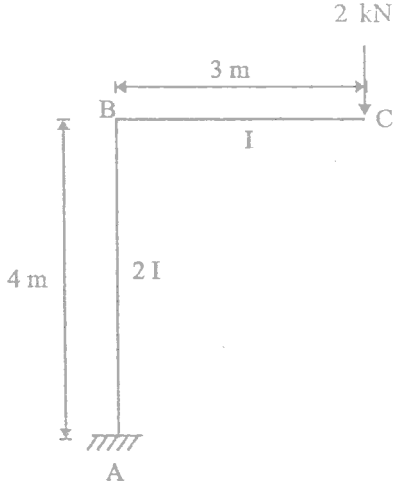

Fig. 1

P. T. O.

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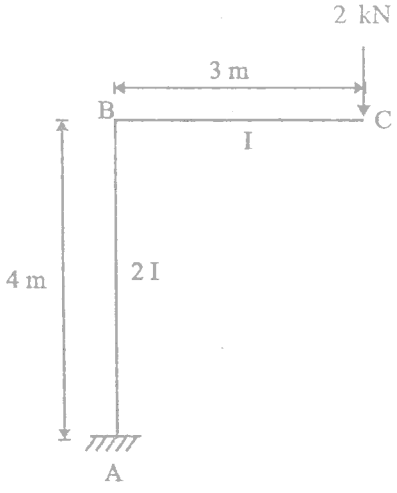

Fig. 1

P. T. O.

Or

A portal frame ABCD is hinged at A and D and has rigid joints at B and C. The frame is loaded as shown in fig. 2. EI is constant for the whole frame. Using strain energy method, analyse the frame and plot the B. M. D. 20

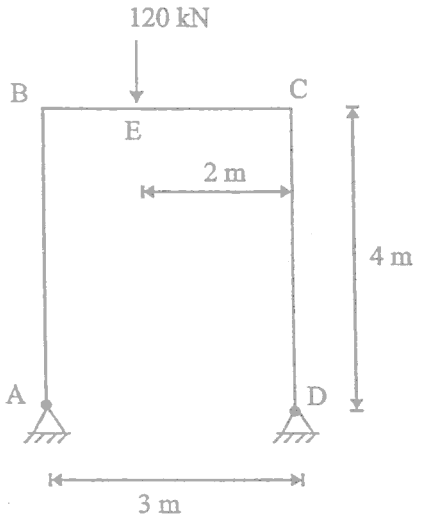

Fig. 2

2. Analyse the continuous beam ABC shown in fig. 3 using three moment equation, if the support B sinks by 5 mm. Draw BMD and SFD also. Given E = 200 kN/mm^2 and I = 1 × 10^8 mm^4. 20

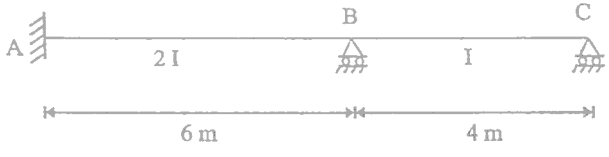

Fig. 3

Or

Using the moment distribution method, determine the end moments of the members of the frame of ahead fig. 4 and draw the BMD. 20

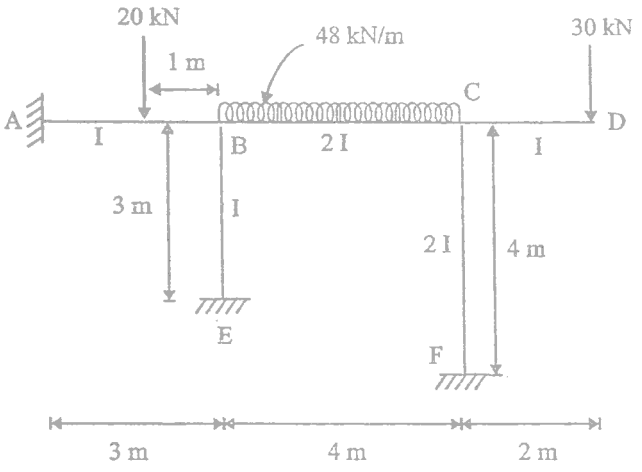

Fig. 4

3. Using the slope deflection method, determine the end moments of the members of the frame of fig. 4 and draw the BMD. 20

Or

Using column analogy method, determine the fixed end moments in the fixed beam shown in fig. 5. 20

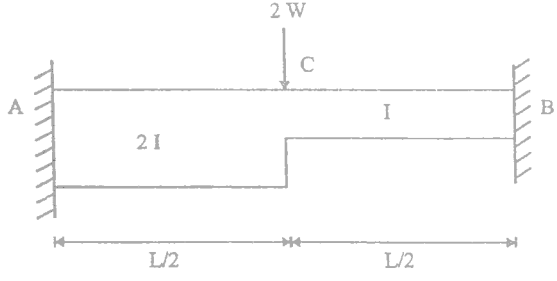

Fig. 5

4. Four point loads 8, 15, 15 and 10 kN have centre to centre spacing of 2 m between consecutive loads traverse a girder of 30 m span from left to right with 10 kN load leading. Calculate the maximum bending moment and shear force at 10 m from the left support. 20

P. T. O.

Or

A train of concentrated loads shown in fig. 6 move from left to right on a simply supported girder of span 20 m. Determine the absolute maximum shear force and bending moment developed in the beam. 20

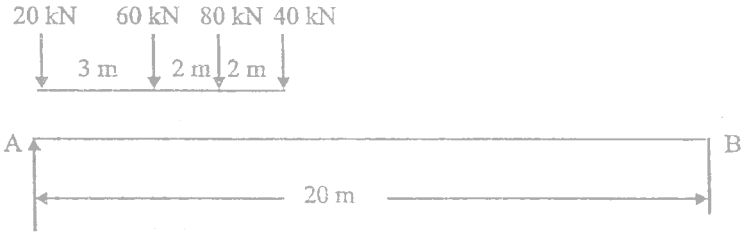

Fig. 6

5. A two-hinged parabolic arch whose moment of inertia $I = I_0 \sec \alpha$ (where I_0 is the MI at the crown and α is the slope) has a span of 25 m and a rise of 5 m. Calculate the value of horizontal thrust when the left half span of the arch is loaded with a u. d. l. of 30 kN/m. Also calculate the B. M. at the crown point. 20

Or

A suspension cable of 60 m span and 6 m dip is stiffened by a three-hinged girder. The dead load is 20 kN/m run. Determine the maximum tension in the cable and the maximum bending moment in the girder due to a concentrated load of 50 kN crossing the span, assuming that the whole dead load is carried by the cable without stressing the girder. Find the B. M. in the girder at $\frac{1}{10}$th of the span from either pier when the concentrated load is 7·5 m from the left hand pier. 20