[Total No. of Questions - 9] [Total No. of Printed Pages - 4]
(2063)

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B.Tech 4th Semester Examination

Structural Analysis - I

CE-4001

Time : 3 Hours **Max. Marks : 100**

The candidates shall limit their answers precisely within the answer-book (40 pages) issued to them and no supplementary/ continuation sheet will be issued.

Note : Attempt five questions in all, select one question from each sections A, B, C and D. Section E is compulsory.

SECTION - A

1. Analyse the frame as shown in Fig. 1 by strain energy method. End 'A' is hinged and End 'D' is fixed. **(20)**

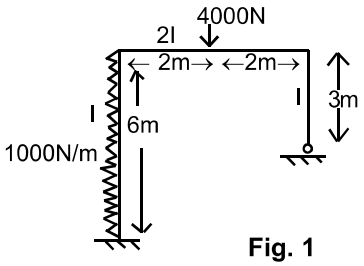

Fig. 1

2. Find the forces in the members of the frame as shown in Fig. 2 using castigations second theorem. All the members have the same sectional area and are made of the same material. **(20)**

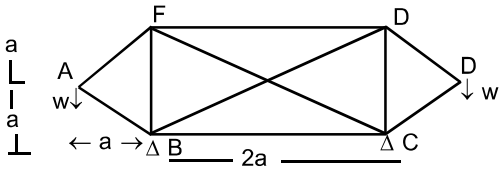

Fig. 2

SECTION - B

3. Analyse the continuous beam as shown in Fig. 3 by slope deflection method. The supports B and C sub 10 mm and 5 mm respectively and the support D rotate through is an anticlockwise angle of 0.1 radian. There are no loads on the beam value of E and I are constant throughout the length of the beam. Take E = 2 $\times 10^5$ MPa, I = 4×10^2 mm^4. Sketch the bending moment diagram. **(20)**

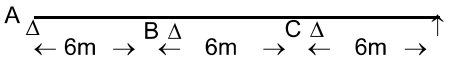

Fig. 3

4. Analyse the structure loaded as shown in Fig. 4 by moment distribution method and sketch the bending moment and shear force diagram. **(20)**

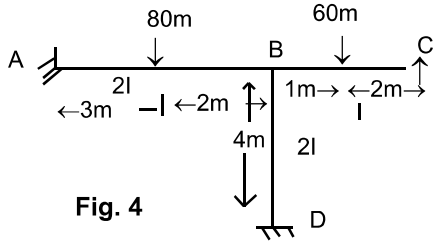

Fig. 4

SECTION - C

5. (a) A two hinged parabolic arch of span land riser carries a load of w/metre run over the left hand half of the span. The moment of inertia of arch rib varies as the secant of the slope of the rib axis. (a) Obtain the expression for the horizontal thrust H. **(10)**

   (b) Calculate the horizontal thrust and the bending moment at quarter span point on the right half of the span if l = 20m, r = 4m and w = 20 kN/m. **(10)**

6. (a) Prove the shear stress in both the flange and web of an I section follows parabolic law. **(10)**

(b) A beam of I section 500 mm deep and 190 mm side has flanges 25 mm thick and web 15 mm thick. It carries shear force of 400kN at a section. Calculate the maximum intensity of shear stress in the section, Assuming the moment of inertia to be 6.45×10^8 mm^4. Also calculate the total shear force earned by the needs and sketch shear stress distribution across the section. **(10)**

SECTION - D

7. (a) A cable is suspended from two point A and B which are 80m apart. A is 5m below B. The lowest point on the cable is 10m below A as shown in fig. 5. The cable supports a wall of intensity 20 kN/m over the entire span. Complete the (1) reactions at supports (ii) maximum tension in the cable. **(10)**

Fig. 5

` (b) A cable of uniform section is suspended between two supports 100m apart. It carries an uniformly distributed load of 10 kN/m spread over the horizontal span. The lowest point of cable sages 10m below the supports. Find (i) maximum and minimum tension in the cable and its inclination (ii) Minimum required cross sectional area of cable of the allowable stress is 280Mpa (ii) length of cable.

8. (a) A three hinged stiffening girder of a suspension bridge of 100m span is subjected to two points loads of 10 kW each placed at 200m and 40m respectively from the left hinge. Determine the bending moment and shear force in the girder at a section 30m from the left end. Also determine the tension in the cable which has a central dip of 10m. **(10)**

[P.T.O.]

(b) Fig. 6 shows the suspension bridge alongwith three hinged shuffling girder. Find the maximum tension in the cable due to point A 225km crossing the bridge. **(10)**

Fig. 6

SECTION - E

9. (a) Define degree of redundancy of a structure.

(b) State the theorem useful for application to redundant structures.

(c) How many slope deflection equations are available for a two span continuous beam.

(d) In a member AB, if a moment of 10KN/m is applied at A, what is the moment carried over to B?

(e) Name atleast four methods used for the computation of deflections in structures.

(f) What is the difference between the basic action of an arch and a suspension cable?

(g) Explain the effect of yielding of support in the case of an arch.

(h) Where do you get the maximum tension in a suspension cable, when it is supported at different levels? Assume that the left support is at a higher elevation than the right support.

(i) What are the difference between suspension bridges with two hinged and three hinged stiffening girder.

(j) What is the effect of change in temperature in a particular member of a redundant frame. **(10×2=20)**