53 (CE 402) STAN

2014

STRUCTURAL ANALYSIS-I

Paper : CE 402

Full Marks : 100

Pass Marks : 30

Time : Three hours

The figures in the margin indicate full marks for the questions.

Answer ***any five*** *questions from* ***six.***

1. *(a)* Analyse and draw shear force and bending moment diagrams for the cantilever shown in *Fig.* 1. 10

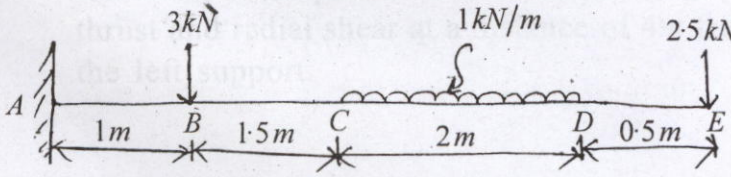

Fig. 1

(b) Analyse and draw shear force and bending moment diagrams for the simply supported beam shown in *Fig.* 2. 10

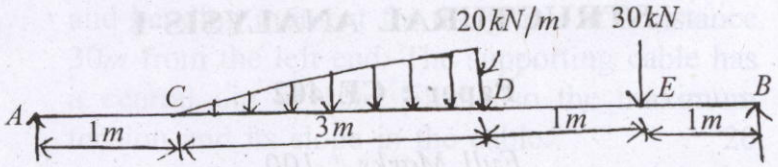

Fig. 2

2. (a) A horizontal cantilever of uniform section of length l carries two point loads, 'ω' at the free end and $2w$ at a distance of 'a' from the free end. Find the maximum deflection and slope due to this loading. If the section is rectangular $120mm$ side and $240mm$ deep, and $l=1{\cdot}5m$ and $a=0{\cdot}5m$, $w=1500N$, find the maximum deflection for loading. 10

(b) What do you mean by Macaulay's method ? Calculate maximum deflection and maximum slope by Macaulay's method for the simply supported beam as shown in *Fig.* 3. 10

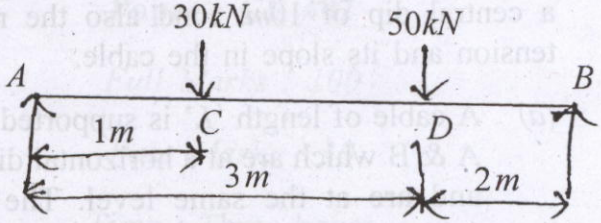

Fig. 3

Given $E = 210 \times 10^6\ kN/m^2$

$I = 7 \times 10^7\ mm^4$.

3. A 3-hinged parabolic arch of span $20m$ and radius $5m$ carries an UDL of $20kN/m$ on the left half of the span. Calculate the BM, normal thrust and radial shear at a distance of $4m$ from the left support. 20

4. A three hinged stiffening girder of a suspension bridge of span $100m$ is subjected to two point loads of $200kN$ and $300kN$ at the distance of $25m$ and $50m$ from the left end. Find the shear force and bending moment for the girder at a distance $30m$ from the left end. The supporting cable has a central dip of $10m$. Find also the maximum tension and its slope in the cable. 20

5. *(a)* A cable of length 'L' is supported at points A & B which are at a horizontal distance 'l' and are at the same level. The cable is subjected to a uniformly distributed load $w/unit$ horizontal length. Find the length of the cable 'L'. 8

(b) A light cable is supported at two points $20m$ apart which are at the same level. The cable supports three concentrated loads as shown in *Fig.*4. The deflection at first point is found to be $0{\cdot}8m$. Determine the tension in the different segments and total length of the cable.
(Fig. 4 to be supplied) 12

6. A horizontal cantilever of length 'l' supports a uniformly distributed load of w per unit run along its length. The cantilever is propped to the level of the fixed end at a distance $\frac{3}{4}\ l$ from the fixed end. Find the reaction of the prop. 20
