53 (CE 402) STAN

2017

STRUCTURAL ANALYSIS-I

Paper : CE 402

Full Marks : 100

Time : Three hours

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

*Answer **any five** questions out of **Seven**.*

1. *Fig. 01* shows a pin-jointed truss loaded with a single load $W = 100kN$. If the area of cross-section of all members shown in figure is $1000mm^2$, what is the vertical deflection of point C ? Take $E = 200\,kN/mm^2$ for all members. 20

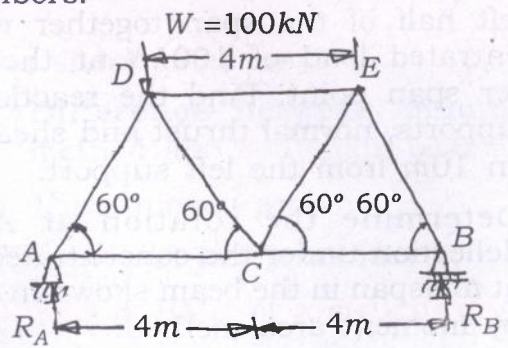

Fig. 01

Contd.

2. *(a)* A light cable $18m$ long is supported at two ends of the same level. The supports are $16m$ apart. The cable support's $120N$ load dividing the distance into two equal parts. Find the Horizontal thrust at the supports and the tension in the cable. 10

(b) For a cable subjected to uniformly distributed load, and supported at two ends, derive that actual length of the cable, 'L' is given by 10

$$L = l + \frac{8h^2}{3l}$$

where, l = straight line distance between the supports of the cable.
h = rise of the cable.
L = actual longth of the cable.

3. A three hinged circular arch hinged at the springing and crown point's has a span of $40m$ and a central rise of $8m$. It carries a uniformly distributed load of $20kN/m$ over the left half of the span together with a concentrated load of $100kN$ at the right quarter span point. Find the reactions at the supports, normal thrust and shear at a section $10m$ from the left support. 20

4. *(a)* Determine the rotation at A and deflection under the concentrated load at midspan in the beam shown in *Fig.02* by moment area method. 10

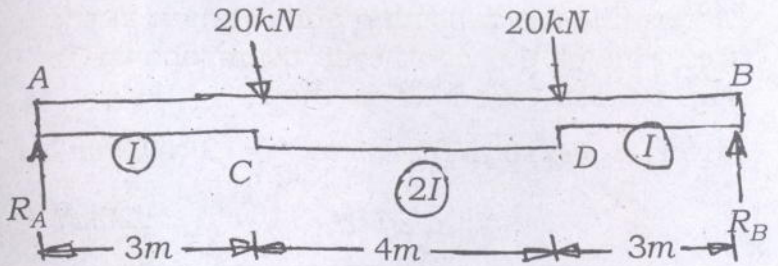

Fig. 02

(b) Using conjugate beam method, determine the deflection and rotation at the free end in the beam as shown in *Fig. 03.* 10

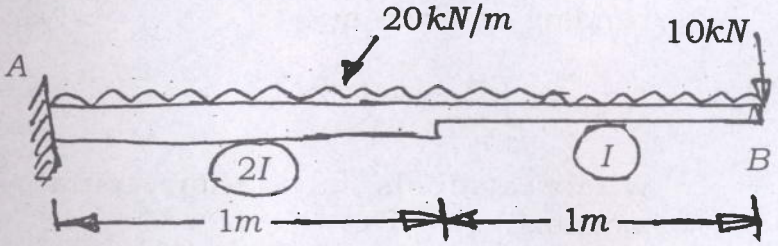

Fig. 03

5. Write short notes on : 4×5=20

(a) Difference between moment area method and conjugate beam method

(b) Three hinged arch

(c) Degree of indeterminacy

(d) SFD & BMD of a structure.

6. Determine the deflection and rotation at the free end of the cantilever beam shown in *Fig. 04* use unit load method.

Given $E = 2\times10^5\ N/mm^2$ and $I = 12\times10^6 mm^4$

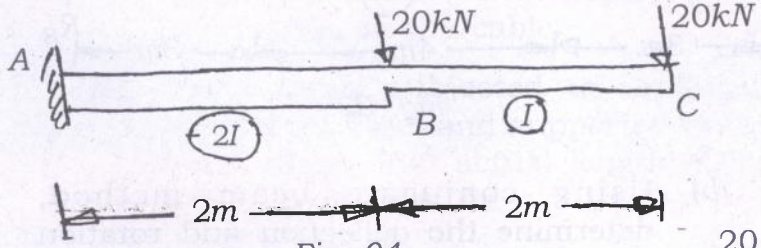

Fig. 04 20

7. *(a)* Derive that strain energy '*U*', due to bending, is given by

$$U = \int_0^L \frac{M^2}{2EI} dx$$

Where symbols have their usual meaning. 10

(b) Determine the deflection under 60*kN* load in the beam shown in *Fig. 05.* Use strain energy method. 10

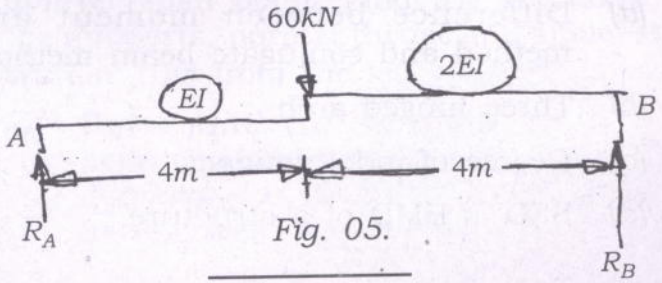

Fig. 05.