Total number of printed pages = 5

19/4th Sem/DCE 401

2022

STRUCTURAL ANALYSIS-I

Full Marks – 100

Time – Three hours

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

Answer any *five* questions.

1. (a) What are statically determinate and indeterminate structures ? 3

   (b) What is the basic objective of structural analysis ? 2

   (c) Find whether the structure is statically determinate or indeterminate. If indeterminate, then find the internal, external, degree and value static indeterminacy. 15

   (i)

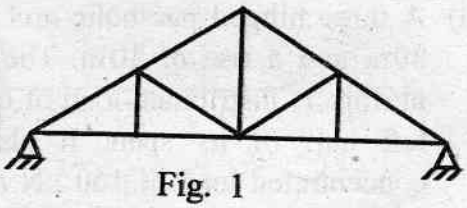

Fig. 1

[Turn over

(ii)

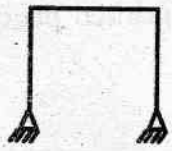

Fig. 2

(iii)

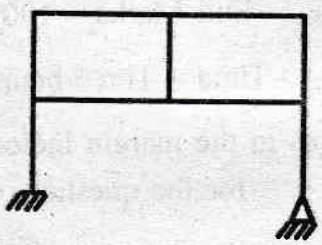

Fig. 3

2. (a) Why anchor cables are provided in suspension bridges ? 2

(b) How the central sag or dip of the cable is considered ? 2

(c) Define the following terms : 4

(i) Span (ii) Crown

(iii) Rise (iv) Springing points.

(d) A three hinged parabolic arch has a span of 30m and a rise of 10m. The arch carries a uniformly distributed load of 60 kN/m on the left half of its span. It also carries one concentrated load of 160 kN at 5m from the

right end. Determine the support reactions, moment and vertical shear at 5m from the left support. 12

3. A light cable is supported at two points 16m apart which are at same level. The cable supports three concentrated loads as shown in fig.4. The deflection at first point is found to be 0.8m. Determine the tension in the different segments and total length of the cable. 20

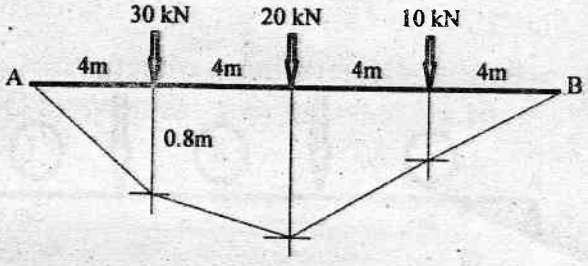

Fig. 4

4. (a) Determine the rotation and deflection at the free end of the cantilever beam as shown in Fig.5. by Moment Area method. 12

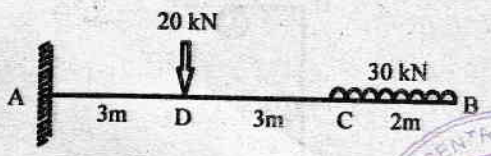

Fig. 5

(b) Determine the deflection and rotation at the free end of the cantilever, use the unit load method Fig. 6. 8

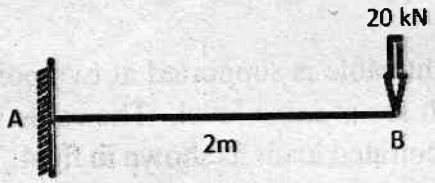

Fig. 6

5. Determine the rotation at A and C and deflection at C and mid-span by conjugate beam method. Fig. 7. 20

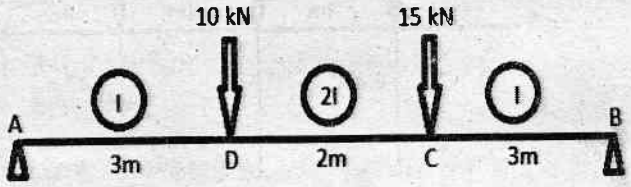

Fig. 7

6. (a) Determine the vertical deflection of point C in the frame. Give E=200 kN/mm^2, I=30 × 10^6 mm^4. Fig. 8, use Strain Energy method. 15

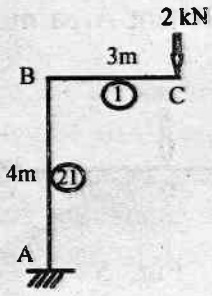

Fig. 8

(b) Define Strain Energy and Castigliano's first theorem. 5

7. (a) Using Castigliano's theorem determine the deflection under the load, fig. 9. 10

Fig. 9

(b) Determine the rotation and deflection at point C by Moment area method, Fig.10. 10

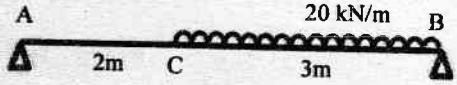

Fig. 10