53 (CE 402) STAN

2012 C
2013
(May)

STRUCTURAL ANALYSIS

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* ***seven*** *questions.*

1. *(a)* Define Castigliano's first theorem. 2

(b) Determine the vertical and horizontal displacement at the free end D in the frame shown in *fig. 01* 18

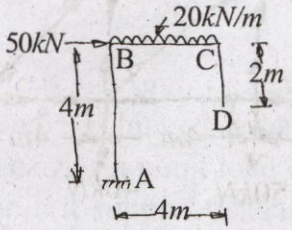


fig. 01

2. Determine the vertical deflection of point D in the truss shown in *fig. 02*. The cross-sectional areas of members AD and DE are $1500mm^2$ while those of the other members are $1000mm^2$. Take $E = 200\,KN/mm^2$. 20

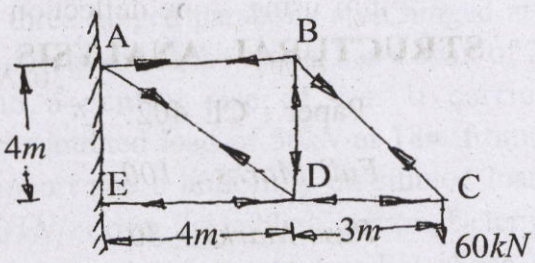


fig. 02

3. *(a)* What is meant by degree of Indeterminacy in case of a Indeterminate beam ? 2

(b) Determine the force in the members of the truss shown in *fig. 03*. The cross-sectional area of vertical and horizontal members is $4000mm^2$ and that of the diagonals is $5000mm^2$. 18

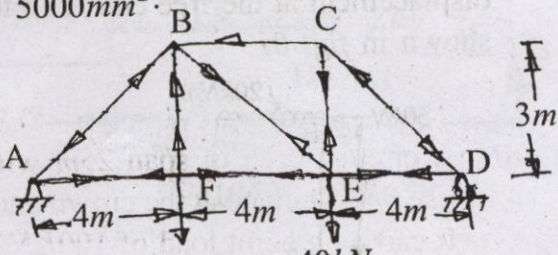


fig. 03

4. *(a)* What is the difference between internal indeterminacy and external indeterminacy ? 4

(b) Analyse the continuous beam shown in *fig. 04* and draw the bending moment diagram using slope deflection method. 16

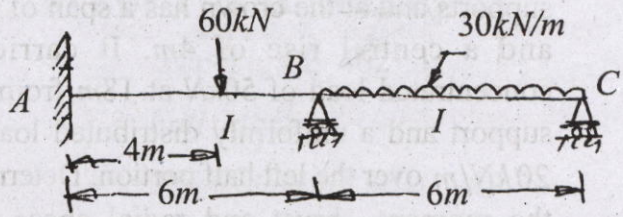


fig. 04

5. Analyse the continuous beam shown in *fig.05* and draw bending moment diagram. Use moment distribution method. 20

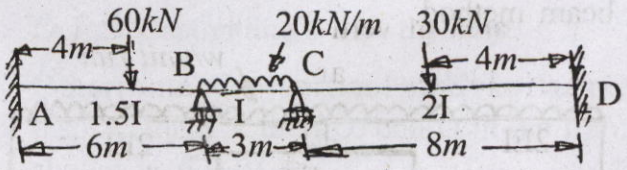


fig. 05

6. *(a)* A circular arch of span 25*m* with a central rise 5*m* is hinged at the crown and springing. It carries a point load of 100*KN* at 6*m* from the left support. Calculate

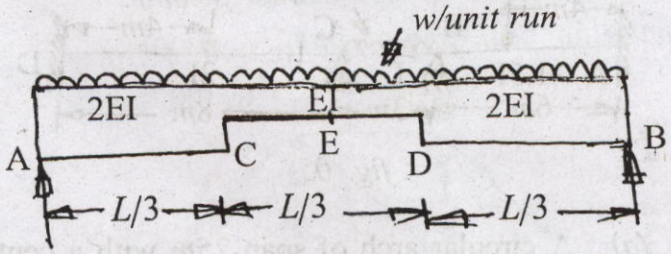
(i) The reactions at the supports.

(ii) The reactions at crown.

(iii) Moment at $5m$ from the left support. 10

(b) A three hinged parabolic arch hinged at the supports and at the crown has a span of $24m$ and a central rise of $4m$. It carries a concentrated load of $50kN$ at $18m$ from left support and a uniformly distributed load of $20\,kN/m$ over the left half portion. Determine the moment, thrust and radial shear at a section $6m$ from the left support. 10

7. Determine the slope at A, deflection at midspan E in the beam as shown in *(fig. 06)*, use conjugate beam method. 20



(*fig. 06*)