(Pages : 3) **K – 4252**

Reg. No. : .....

Name : .....

Fourth Semester B.Tech. Degree Examination, September 2020

13.403 : STRUCTURAL ANALYSIS – I (C)

(2013 Scheme)

Time : 3 Hours Max. Marks : 100

PART – A

Answer **all** questions.

1. How is the equilibrium method of analysis different from the compatibility method of analysis?

2. Derive the expressions for strain energy and complementary strain energy of a straight prismatic bar of length L and cross-sectional area A if it is subjected to an axial force F.

3. Define Eddy's s theorem. How is it used in the analysis of arches?

4. Write the assumptions made in Euler's theory.

5. A simply supported girder has a span of 12 m. A 200 kN wheel load moves from one end to the other end on the span of the girder. Find the maximum bending moment which can occur at a section 4 m from the left end.

(5 × 4 = 20 Marks)

P.T.O.

PART – B

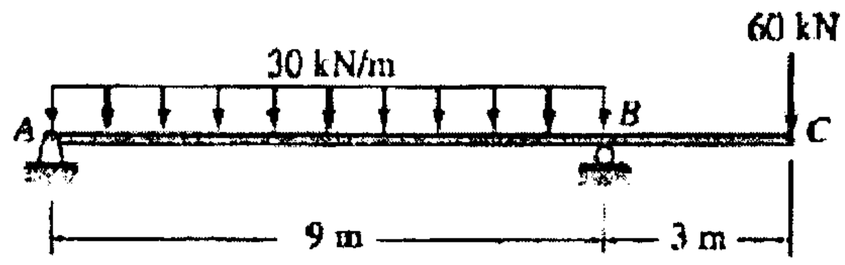
Answer **any one full** questions from **each** Module.

Module – I

6. A simply supported beam of span 6 m is carrying a load of 12 kN/m for the right half of the span. If E = 200 kN/mm^2 and I = 5.5 × 10^{-4}m^4, find the maximum slope at the support and maximum deflection. **20**

OR

7. Using moment-area method, evaluate deflection at C of over-hanging beam ABC shown in figure below. Take E = 200 kN/mm^2 and I = 800 × 10^6 mm^4. **20**

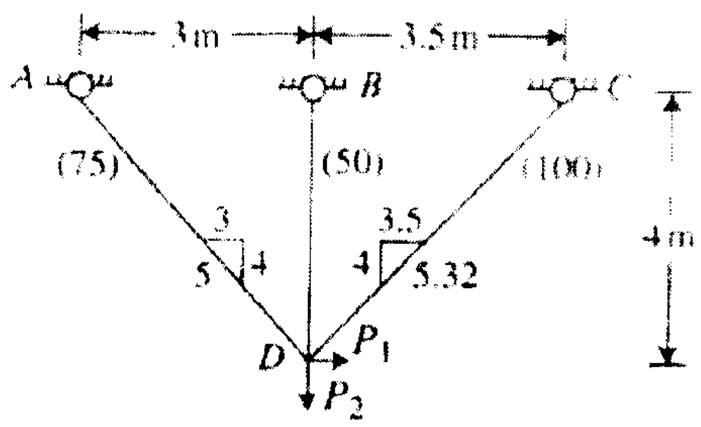


Module – II

8. Calculate the horizontal and vertical forces at D in the three-wire system shown in figure below in order to produce

   (a) unit horizontal displacement at D without any vertical displacement at D. and

   (b) unit vertical displacement at D without any horizontal displacement at D. Area of cross section of each member is shown alongside in mm^2. Take E = 200 GPa. **20**



OR

9. A simply supported beam of span 6 m is subjected to 15 kN and 30 kN respectively at 1.5 m and 3.0 m from the left support. Using energy method, calculate rotations at the supports if EI =10,000 kNm^2. **20**

Module – III

10. The span and rise of an arch are 40 m and 10m respectively. The equation of the arch is $y = x-(x^2/40)$ with the origin at the left abutment and X-axis directed towards right and Y-axis upwards. If a udl of 15 kN/m is applied on the left half of the arch, find the reactions at abutments. Draw the bending moment diagram; also determine the locations of maximum moments. **20**

OR

11. Find the ratio of the strength of a solid circular column with that of a hollow circular column of equal area, whose internal diameter is $\frac{2}{3}$ the external diameter. Both the columns are of the same material having the same length and are hinged at their ends. **20**

Module – IV

12. A udl of length 5 m and intensity 25 kN/m moves across a simple beam of span 30 m. Determine the maximum negative and positive shear force, and maximum bending moment at sections 3 m, 7 m, 12 in from the left support and also the absolute maximum shear force and bending moment. Draw the SFD and BMD. **20**

OR

13. Two point loads of 50 kN and 75 kN spaced 3 m apart with the 50 kN load leading passes over a simply supported span of 12 m from left to right. Using influence line diagrams, calculate the maximum shear force and bending moment at a section 4.8 m from the left-hand support. Also find out the section and the magnitude of the absolute maximum bending moment that may occur anywhere on the beam. **20**

(4 × 20 = 80 Marks)