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Reg. No. : .....

Name : .....

Fourth Semester B.Tech Degree Examination, June 2019

(2013 Scheme)

13.403 STRUCTURAL ANALYSIS – I (C)

Time : 3 Hours Maximum Marks : 100

PART – A

Answer **all** questions

1. A propped cantilever beam is subjected to uniformly distributed load over the entire span. If an internal hinge is provided at the mid-span location, draw the conjugate beam (with appropriate supports and loading shapes) that can be used for calculating displacement responses of the real beam?

2. Define Castigliano's theorems.

3. A prismatic column is fixed at the ends. Derive the expression for Euler buckling load.

4. What are the limitations of Euler's formula?

5. Two wheel loads 80 kN and 200 kN spaced 2 m apart move on a girder of span 16 m, Find the maximum positive and negative shear force at a section 4m from the left end. Any wheel load can lead the other.

(5 × 4 = 20 Marks)

P.T.O.

PART – B

Answer **one** full question from each module

MODULE I

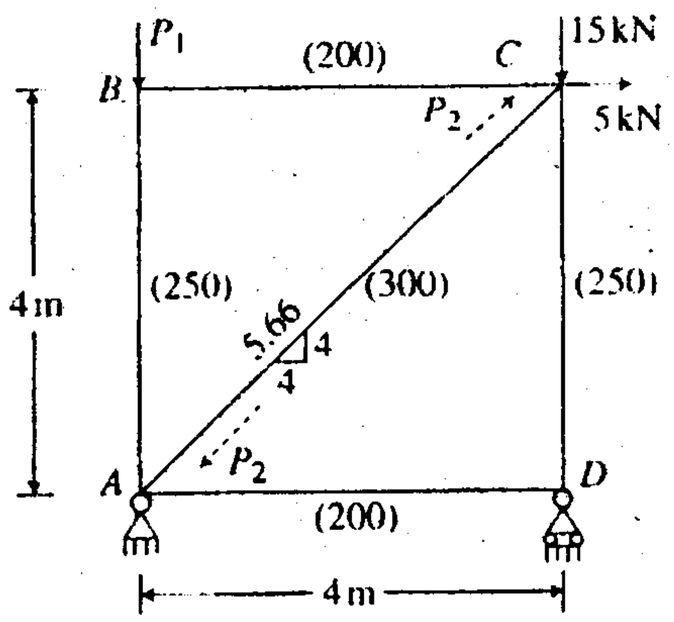
6. A simply supported beam of span 5 m is subjected to a concentrated load of 50 kN at 2 m from the left support. If the Young's modulus is 200 kN/mm^2 and moment of inertia is 5 x 10^{-5}m^4, determine the slope and deflection at mid-span using conjugate-beam method. 20

OR

7. Find the rotation at supports of a simple beam when it is subjected to a central load *W* and the moment of inertia of portion L/4 of the beam on either side of mid-span is *4I* and the remaining L/4 portion near either support is *2I*. 20

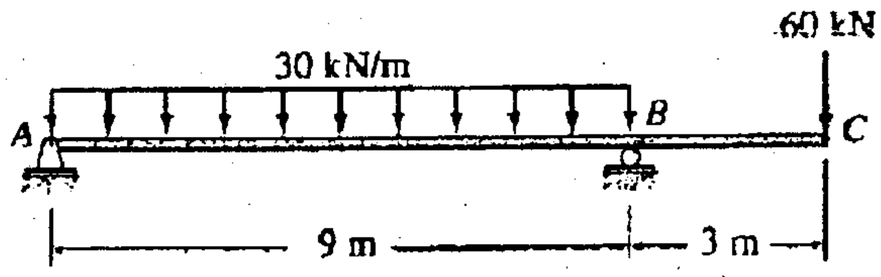
MODULE II

8. Determine the vertical displacement of the joint B and the relative displacement of the joints A and C in the pin-jointed plane frame as shown in figure below. The areas of cross section of the members in mm^2 are indicated alongside the members. Take E = 200 GPa. 20



OR

9. Using energy method, find deflection at centre of span AB of a over-hanging beam ABC shown in figure below. Take E = 200 GPa and I = 800 x 10^6 mm^4. 20



MODULE III

10. A three hinged parabolic arch ACB is hinged at the supports A and B which are below the crown hinge C by 3 m and *6.75* m respectively. The span of the arch is 22.5 m. The arch carries a udl of 30 kN/m from A to C. Find the reactions at the supports and the maximum positive and negative bending moments. 20

OR

11. A hollow cylindrical cast iron column is *4* m long, both ends being fixed. Design the column to carry an axial load of 250 kN. Use Rankine's formula and adopt a factor of safety of *5*. The internal diameter may be taken as 0.80 times the external diameter. Take F_c = 550 MPa and $\alpha = \frac{1}{1600}$ 20

MODULE IV

12. Two concentrated loads of 50 kN and 75 kN separated by 4 m rolls across a beam of 12 m span from left to right with *50* kN load leading the train. Draw the maximum SFD and BMD. Also, locate the position and calculate the magnitude of the absolute maximum bending moment. 20

OR

13. A girder simply supported has a span of 24 m. A udl of intensity 20 kN/m and 6 m long crosses the girder. Using influence line diagrams find the maximum shear force and bending moment at a section 9 m from the left support. 20

(4 × 20 = 80 Marks)