C 80678 (Pages : 4) Name.....

Reg. No.....

FOURTH SEMESTER B.TECH. (ENGINEERING) [09 SCHEME] DEGREE EXAMINATION, APRIL 2015

CE 09 404/PTCE 09 403—STRUCTURAL ANALYSIS—I

Time : Three Hours Maximum : 70 Marks

Part A

Answer **all** *questions.*

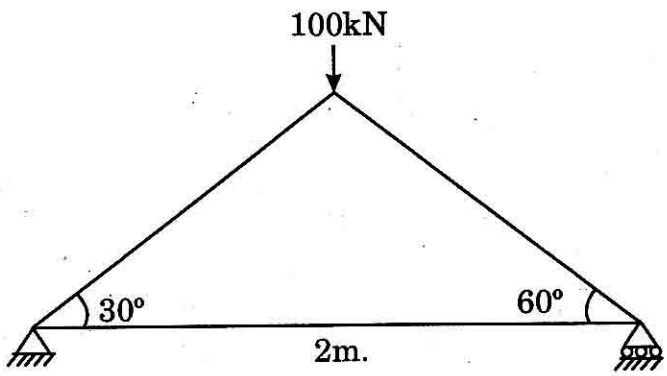
1. State and explain Castigliano's first theorem for deflection.
2. Explain strain energy. Write the relations for strain energy due to bending moment and due to torsion.
3. State and explain Clapeyron's Three moment theorem.
4. Derive the relation for maximum bending moment at sections in a simply supported when a uniformly distributed load shorter than span moves from left to right.
5. State the structural behaviour difference between cables and arches.

(5 × 2 = 10 marks)

Part B

Answer any **four** *questions*

6. Determine the deflection under the load, for the beam AB of span 5 m. carrying a point load of 50 kN. acting at 2 m. from left support by unit load method. Given $E = 2 \times 10^5$ N/mm^2, $I = 4 \times 10^7$ mm^4.
7. Using the principle of virtual work, determine the vertical and horizontal deflections of joint C of truss. Given E = 200 kN/mm^2. and sectional area of each bar is 5×10^6 mm^4.



Turn over

8. Derive the relations for fixed end moments if the support B of a fixed beam AB rotates by an amount θ, and draw the bending moment diagram.

9. A simply supported beam has a span of 5 m. Draw influence line for reactions R_A, R_B, shear force and bending moment at section X-X, 2 m. from left support.

10. Draw the influence line for the support moment M_A at A for the propped cantilever AB spanning 9 m, where propping is done at B. Compute the Influence line ordinates at 1.5 m. intervals.

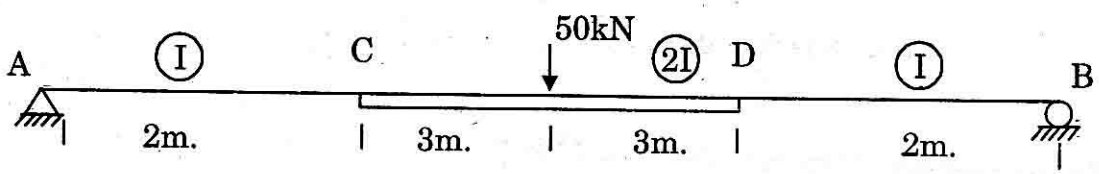
11. A parabolic three hinged arch of span 20 m. is subjected to a uniformly distributed load of 10 kN/m. over the left side of crown. Find the horizontal thrust and support reactions.

(4 × 5 = 20 marks)

Part C

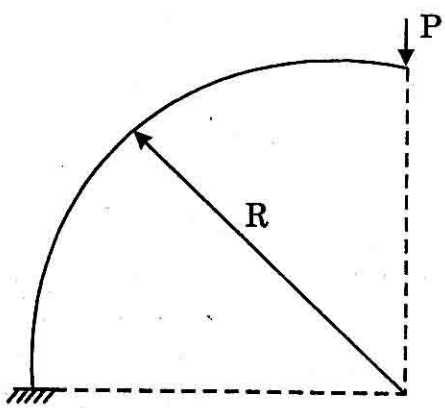
Answer **all** *questions.*

12. (a) Determine the slope at A for the beam in fig. Take E – 2×10^6 N/mm^2, I – 4×10^6 mm^4.

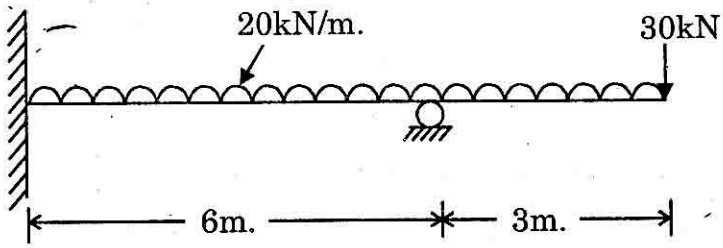


Or

(b) Determine the vertical and horizontal displacements under the point load of a quadrant of thin circular ring of radius R as in fig.

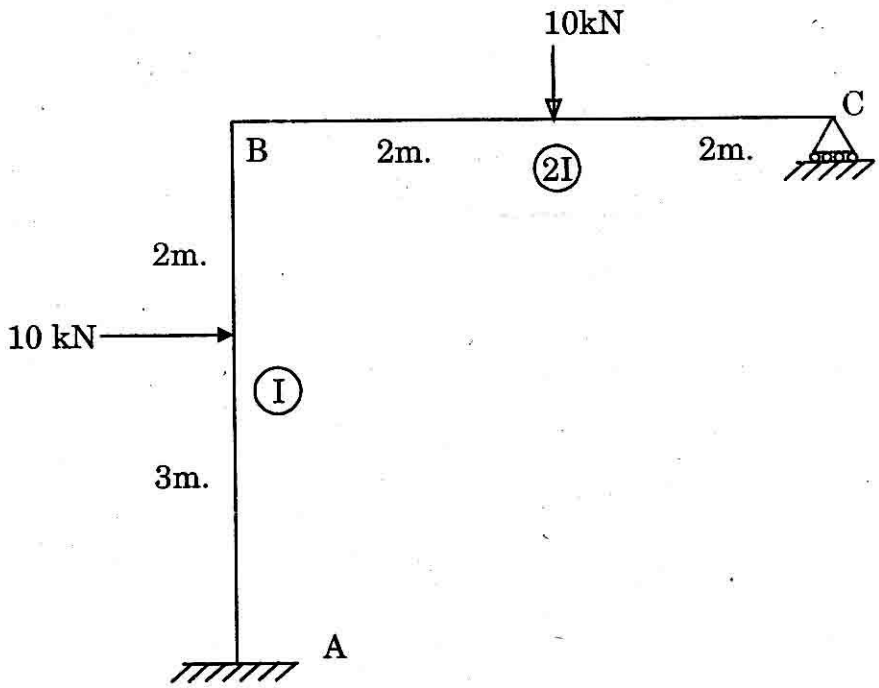


13. (a) Analyse the beam using method of consistent deformation and determine the reaction components and draw shear force and bending moment diagram.



Or

(b) Analyse the frame by the method of consistent deformation. Draw the axial force, shear force and bending moment diagram.



14. (a) Five point loads of 80, 80, 150, 150 and 90 kN spaced at 2, 2.5, 2 and 1.5 m. in order, cross a girder of 24 m. span from left to right with 80 kN leading. Calculate the maximum BM at 9 m. from left hand end and also the position and amount of maximum bending moment anywhere in the girder.

Or

(b) Two equal loads of 90 kN spaced 4 m. apart, roll over a girder of 12 m. span. Calculate the maximum bending moment any where in the girder.

15. (a) A parabolic three hinged arch of span 16 m. and central rise 3 m. is subjected to a uniformly distributed load of 30 kN/m. over the left half of the span. Find the horizontal thrust and bending moment, normal thrust and radial shear at section X 2 m. from left support.

Or

(b) A parabolic two hinged arch of span 20 m. and central rise 4 m. is subjected to a uniformly distributed load of 20 kN/m. over the left half of the span. Find the horizontal thrust and bending moment at quarter span point on the right half of span.

(4 × 10 = 40 marks)