Code: 15A01403 **R15**

B.Tech II Year II Semester (R15) Regular & Supplementary Examinations May/June 2018

STRUCTURAL ANALYSIS – I

(Civil Engineering)

Time: 3 hours Max. Marks: 70

PART – A

(Compulsory Question)

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1 Answer the following: (10 X 02 = 20 Marks)

(a) Derive the expression for strain energy of a straight prismatic bar of length 'L' and cross sectional area 'A', if it is subjected to an axial force 'F'.

(b) A simply supported beam of length 'L' carries a point load 'W' at the centre. Find the deflection using energy theorem.

(c) Give examples each of statically indeterminate and kinematic indeterminate structures. Calculate degree of indeterminacy in each of the cases.

(d) Define static indeterminacy and degree of indeterminacy.

(e) What are the factors that affect bending moment in the continuous beam due to support elements?

(f) Draw the SFD and BMD for a fixed beam when one of its supports sinks.

(g) Write the expression M_{AB} in terms of fixed moments and slopes θ_A and θ_B.

(h) What are the sign conventions used in slope deflection equations and write the equations?

(i) Define stiffness and carry over factor in moment distribution method.

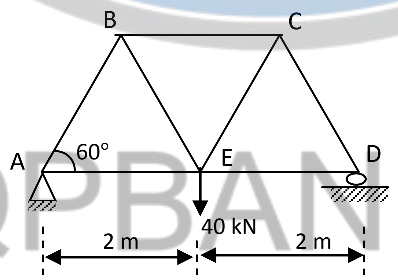
(j) What is sinking of supports? What is its effect on the end moments of the member?

PART – B

(Answer all five units, 5 X 10 = 50 Marks)

UNIT – I

2 Determine the vertical deflection of joint 'E' for the truss shown in figure below. Take A = 500 x 10^{-6} m^2; E = 200 x 10^6 kN/m^2 are constant for all members. Use strain energy method.

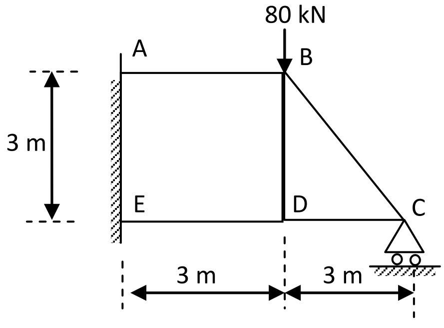


OR

3 Analyze a continuous beam simply supported at A, B and C. The span AB is 6 m and BC is 8 m. The span AB is carrying an UDL of 30 kN/m and span BC carries a load of 40 kN at distance of 3 m from B. Use strain energy method. Draw the BMD.

UNIT – II

4 Find the forces in the members of the truss shown in figure below. The cross sectional area and young's modulus of all the members are the same.



OR

5 List out the methods of analysis of indeterminate structures and explain any one method with example.

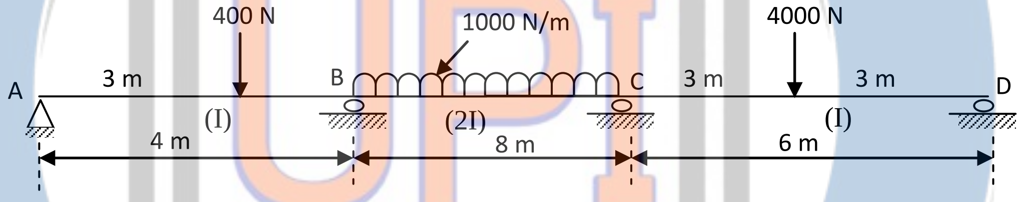
Contd. in page 2

UNIT – III

6 A fixed beam of span 6 m is subjected a UDL of 5 kN/m on the left half of the span and a point load of 15 kN at the middle of the right half of the span. Draw the SFD and BMD.

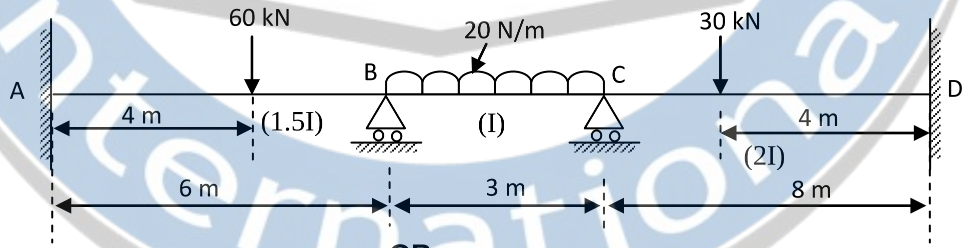
OR

7 A continuous beam ABCD 18 m long is loaded as shown in figure below. During loading support 'B' sinks by 10 mm. Find support moments and plot shear force and bending moment diagrams for the beam. Take E = 20 kN/mm^2, I = 8 x 10^6 mm^4.



UNIT – IV

8 Analyze the continuous beam shown below by slope deflection method and draw bending moment diagram.



OR

9 A continuous beam is fixed at A and is supported over rollers at B and C. AB = BC = 12 m. The beam carries a UDL of 30 kN/m over AB and a point load of 240 kN at a distance of 4 m from B on span BC. B has an settlement of 30 mm. E = 2 x 10^5 N/mm^2, I = 2 x 10^9 mm^4. Analyze the beam by slope deflection method.

UNIT – V

10 A simply supported beam ABC is continuous over two spans AB and BC of 6 m and 5 m respectively. Span AB is carrying a UDL of 2 kN/m and span BC carries point load of 5 kN at a distance of 2 m from B. Find the support moment at B if EI of the beam is constant. Use moment distribution method.

OR

11 Analyze the portal frame by moment distribution method. Draw the bending moment diagram and sketch the deflected shape of the structure. The two columns of AB and CD of 5 m height with 'I", beam BC of span 5 m, with '2I' the beam BC carries an UDL of 15 kN/m. The supports at A and D are fixed.

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