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BICE-008

B.Tech. CIVIL ENGINEERING (BTCLEVI)

Term-End Examination

00603

December, 2016

BICE-008 : STRUCTURAL ANALYSIS – I

Time : 3 hours *Maximum Marks : 70*

Note : *Attempt any **seven** questions. Assume missing data, if any. All questions carry equal marks. Use of scientific calculator is allowed.*

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1. (a) Differentiate between shear strain and volumetric strain. *4*

(b) A hollow cast-iron cylinder, 4 m long, 300 mm outer diameter and thickness of metal 50 mm, is subjected to a central load on the top when standing straight. The stress produced is 75000 kN/m^2. Assume Young's modulus for cast-iron as $1{\cdot}5 \times 10^8$ kN/m^2 and find : *6*

(i) Magnitude of the load

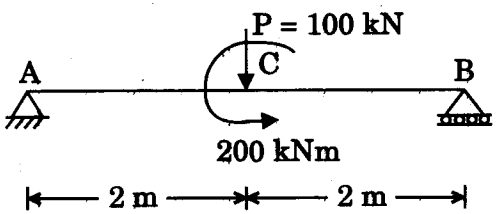
(ii) Longitudinal strain produced

(iii) Total decrease in length

2. A steel wire, 2·5 m long and 4 mm in diameter, is extended by 0·85 mm when a weight 'W' is suspended from the wire. If the same weight is suspended from a brass wire, 3 m long and 2·5 mm in diameter, it is elongated by 4·6 mm. Determine the modulus of elasticity of brass, if that of steel be 2×10^5 N/mm^2. *10*

3. Explain different classifications of beams depending upon the types of supports and draw the figure of each type of beam. *10*

4. Draw the shear force and bending moment diagrams for the simply supported beam loaded with a concentrated force, P = 100 kN and a concentrated moment, M_C = 200 kNm as shown in the figure below. *10*



5. (a) Write down the assumptions of Euler's theory for long columns. *4*

(b) A solid round bar, 60 mm in diameter and 2·5 m long, is used as a strut. One end of the strut is fixed, while its other end is hinged. Find the safe compressive load for this strut, using Euler's formula. Assume E = 200 GN/m^2 and factor of safety = 3. *6*

6. Derive Euler's formula for the column with both ends hinged or pinned. *10*

7. (a) Explain the reasons of unsymmetrical bending in a beam. *3*

   (b) Derive the total or resultant deflection, 'δ' of a beam due to unsymmetrical bending. *7*

8. Determine the dimensions of the joist of a timber for span 8 m to carry a brick wall, 200 mm thick and 5 m high, if the density of brick-work is 1850 kg/m^3 and the maximum permissible stress is limited to 7·5 MN/m^2. Given that the depth of the joist is twice the width. *10*

9. An I-section beam, 340 mm × 200 mm, has a web thickness of 10 mm and a flange thickness of 20 mm. It carries a shearing force of 100 kN. Sketch the shear stress distribution across the section. *10*

10. Write short notes on the following : *10*

    (a) Fatigue

    (b) Modulus of Rupture

    (c) Modulus of Elasticity

    (d) Poisson's Ratio