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BICE-008

B.Tech. CIVIL ENGINEERING (BTCLEVI)

Term-End Examination

June, 2019

BICE-008 : STRUCTURAL ANALYSIS - I

00595

Time : 3 hours *Maximum Marks : 70*

Note : *Attempt **any five** questions. Use of scientific calculator is permitted.*

1. (a) Draw a labelled stress-strain diagram for a typical structural steel in tension and discuss the properties of different regions of the diagram. 7

   (b) A member is formed by connecting a steel bar to an aluminium bar as shown in Fig. 1. Assuming that the bars are prevented from buckling sidewise, calculate the magnitude of force P, that will cause the total length of the member to decrease by 0.20 mm. Take E for steel and aluminium as 2.1×10^5 N/mm^2 and 7.0×10^3 N/mm^2 respectively. 7

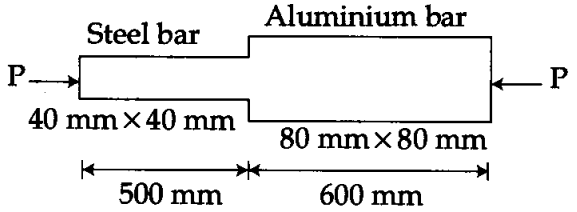

Fig. 1

2. (a) A conical bar tapers uniformly from a diameter of 15 mm to a diameter of 45 mm in a length of 400 mm. Determine the elongation of the bar under an axial pull of 150 kN. Take $E = 2 \times 10^5$ N/mm^2. 7

(b) A metallic specimen has modulus of elasticity of 1.1×10^5 N/mm^2 and modulus of rigidity of 0.41 N/mm^2. Determine the Poisson's ratio for the material. 7

3. (a) A simply supported beam of 9 m span is loaded as shown in Fig. 2. Draw the bending moment and shear force diagrams indicating their values at points A, B, C and D. 7

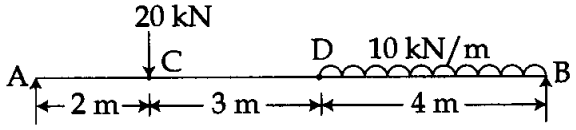

Fig. 2

(b) Describe the assumptions in the simple theory of bending. 7

4. (a) Discuss the Euler's theory of column buckling. 7

(b) A cast iron hollow column, having 100 mm external diameter and 80 mm internal diameter, is used as a column of 2.4 m length. Using Rankine formula, determine the crippling load, when both the ends are fixed. Take fe = 600 N/mm^2 and $a = \frac{1}{1600}$ 7

5. (a) Write the assumptions made in developing equations for stresses and deformations in a bar subjected to pure torsion. 6

(b) Find the maximum torque that can be safely applied to a shaft of 200 mm diameter if the permissible angle of twist is 1° in a length of 5 m and the permissible shear stress is 45 N/mm^2. Take $N = 0.8 \times 10^5$ N/mm^2. 8

6. Which property of a material is evaluated by impact test? Describe any one impact test in detail. 14

7. Write short note on **any four** of the following : **4x3½=14**

(a) Saint Venant's principle

(b) Shear centre

(c) Section modulus

(d) Hoop stresses

(e) Residual stresses