BET-022

Diploma in Civil Engineering / Diploma in Electrical and Mechanical Engineering

02896

Term-End Examination

June, 2010

BET-022 : STRENGTH OF MATERIALS

Time : 2 hours *Maximum Marks : 70*

Note : *Question number **1** is **compulsory**. Attempt **any four** questions from the remaining. Assume suitable data wherever required and mention it clearly. Use of calculator is allowed.*

1. Choose the correct answer from the given alternatives : **7x2=14**

(a) Poisson's ratio may be defined as :

(i) The ratio of longitudinal strain to lateral strain.

(ii) The ratio of longitudinal strain to stress.

(iii) The ratio of lateral strain to stress.

(iv) The ratio of lateral strain to longitudinal strain.

(b) A circular bar of length (l) uniformly tapers from diameter (d_1) at one end to diameter (d_2) at the other end. If the bar is subjected to axial load (P), then its elongation is equal to :

(i) Pl/AE (ii) Pl/A_1A_2E

(iii) $4\ Pl/\pi Ed_1d_2$ (iv) $Pl/4\pi Ed_1d_2$

(c) If a material has identical properties in all directions, it is said to be :

(i) homogeneous (ii) isotropic

(iii) elastic (iv) orthotropic

(d) When a rectangular section of a beam is subjected to a shearing force, the ratio of maximum shear stress to average shear stress is :

(i) 2.0 (ii) 1.75

(iii) 1.50 (iv) 1.25

(e) The point of contra flexure for a beam is a point where :

(i) B. M. is constant

(ii) S. F. is constant

(iii) S. F. changes sign

(iv) B. M. changes sign

(f) A beam of length (l) is simply supported over its both ends. It is carrying uniformly distributed load of intensity ω per unit length. Then its slope at ends will be :

(i) $\omega l^3/24$ EI (ii) $\omega l^4/24$ EI

(iii) $5\ \omega l^2/24$ EI (iv) $5\ \omega l^3/24$ EI

(g) The slenderness ratio of a long column is :

(i) 10 – 20 (ii) 20 – 30

(iii) 50 – 60 (iv) above 80

2. In separate experiments, Young's Modulus and Rigidity Modulus of a material have been determined as 240 GPa and 100 GPa respectively. Calculate the Poisson's Ratio and Bulk modulus of the material. **14**

3. Figure-1 shows the state of stress at a point. Determine the maximum and minimum principal stresses and the plane on which they act. Determine also the magnitude of maximum shearing stress. **14**

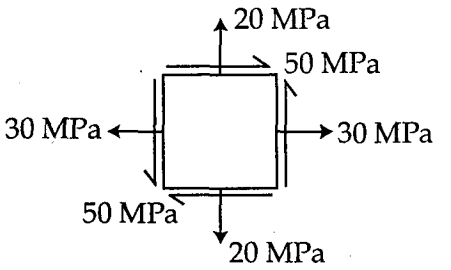

Figure - 1

4. Draw the shear force and bending moment diagram for a simply supported beam of span L carrying three point loads was shown in figure-2. Also determine the value of maximum bending moment. **14**

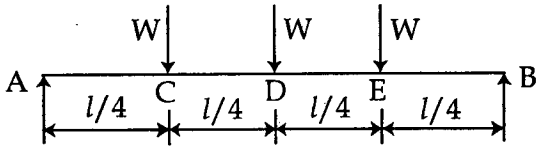

Figure - 2

5. Determine the slope and deflection at points A, B and C of a simply supported beam of span L carrying a point load W at the mid span (c) as shown in figure-3. Also determine the value of maximum deflection. **14**

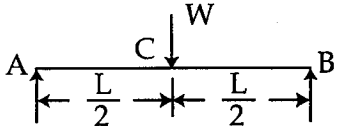

Figure - 3

6. A timber beam 150 mm wide and 300 mm deep is simply supported over a span of 4 m. Find the maximum uniformly distributed load that the beam can carry, if the stress is not to exceed 10 N/mm^2. **14**

7. The internal diameter of a hollow shaft is two third of its external diameter. Compare its resistance to torsion with that of a solid shaft of the same weight and material. **14**

8. Using Euler's theory, compare the buckling strength of two long columns of the same length, material and weight, one of solid circular section 100 mm in diameter, the other of solid square section. Both columns are pinned at the ends. **14**