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BET-022

DIPLOMA IN CIVIL ENGINEERING (DCLE(G)) / DIPLOMA IN ELECTRICAL AND MECHANICAL ENGINEERING (DEME) / DCLEVI / DMEVI / DELVI / DECVI / DCSVI / ACCLEVI / ACMEVI / ACELVI / ACECVI / ACCSVI

Term-End Examination

0265

December, 2014

BET-022 : STRENGTH OF MATERIALS

Time : 2 hours *Maximum Marks : 70*

Note : *Question No. 1 is* ***compulsory****. Attempt any* ***four*** *questions from the remaining ones. Assume suitable data wherever necessary and mention it clearly. Use of scientific calculator is permitted.*

1. Choose the correct alternative : *7×2=14*

(a) Modulus of elasticity is defined as the ratio of

(i) Longitudinal stress to longitudinal strain

(ii) Shear stress to shear strain

(iii) Stress to strain

(iv) Stress to volumetric 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) $Pl / A_1A_2 E$

(ii) $4 Pl / \pi d_1d_2 E$

(iii) $Pl / 4\pi d_1d_2 E$

(iv) Pl / AE

(c) The point of contraflexure for a beam is a point where

(i) Shear force is constant

(ii) Shear forces changes sign

(iii) Bending moment changes sign

(iv) Bending moment is constant

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

(i) $\frac{2}{3}$

(ii) $\frac{3}{4}$

(iii) $\frac{3}{2}$

(iv) $\frac{4}{3}$

(e) A beam of length (l) is simply supported over its both ends. It is carrying uniformly distributed load of intensity w per unit length. The slope at ends will be

(i) $wl^3 / 24\ EI$

(ii) $wl^4 / 24\ EI$

(iii) $5\ wl^2 / 24\ EI$

(iv) $5\ wl^3 / 24\ EI$

(f) If a shaft of diameter d is subjected to torque (T), the maximum shear stress is

(i) $16T / \pi d^2$

(ii) $16T / \pi d^3$

(iii) $32T / \pi d^2$

(iv) $32T / \pi d^3$

(g) A column has maximum crippling load when its

(i) both ends are hinged

(ii) both ends are fixed

(iii) one end is fixed and other end is free

(iv) one end is fixed and other end is hinged

2. (a) Derive the relationship between Modulus of elasticity (E) and Bulk modulus (K). *7*

(b) In two separate experiments, Young's Modulus (E) and modulus of rigidity (G) of a material have been determined as 100 Gpa and 40 Gpa respectively. Calculate the Poisson's ratio and Bulk modulus of the material. *7*

3. At a point in a material, there is a horizontal tensile stress of 80 N/mm^2, a vertical tensile stress of 40 N/mm^2 and shearing stress of 15 N/mm^2 as shown in Figure 1. Determine the maximum and minimum principal stress and the plane on which they act. Determine also the magnitude of maximum shearing stress. *14*

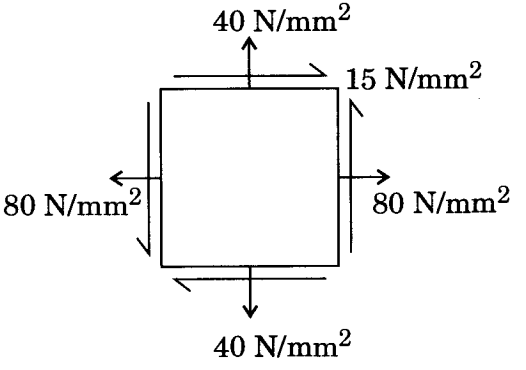

Figure 1

4. A simply supported beam AB of span L is carrying a point load W at a distance 'a' from the end A and 'b' from the end B as shown in Figure 2. Draw the Shear Force and Bending Moment diagrams. *14*

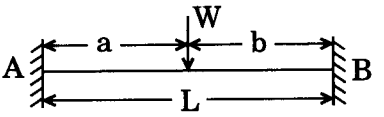

Figure 2

5. A timber beam 120 mm wide and 240 mm deep is simply supported over a span of 5 m. Find the maximum uniformly distributed load that the beam can carry if the stress is not to exceed 12 N/mm^2. *14*

6. A cantilever beam AB of span L carries a uniformly distributed load of w per unit length over the entire span as shown in Figure 3. Calculate the slope and deflection at the ends A and B. *14*

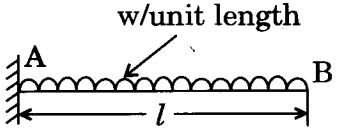

Figure 3

7. Find the power that can be transmitted by a shaft 50 mm diameter at 150 rpm, if the permissible shear stress is 75 N/mm^2. *14*

8. Write short notes on any ***two*** of the following topics : *2×7=14*

   (a) Theory of pure bending of beams

   (b) Euler's crippling load

   (c) Moment of inertia