No. of Printed Pages : 6

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

00303

Term-End Examination

June, 2015

BET-022 : STRENGTH OF MATERIALS

Time : 2 hours *Maximum Marks : 70*

Note : *Question No. 1 is* ***compulsory****. Attempt any* ***four*** *questions from the remaining. 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 can be expressed as

(i) $E = 2G(1 + \nu)$

(ii) $E = 2G(1 - \nu)$

(iii) $E = G(1 + 2\nu)$

(iv) $E = G(1 - 2\nu)$

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

(i) homogeneous

(ii) isotropic

(iii) elastic

(iv) orthotropic

(c) When a shear force at a section changes its sign, then bending moment at that section will be

(i) zero

(ii) minimum

(iii) maximum

(iv) infinity

(d) Moment of resistance for a rectangular beam can be expressed as

(i) $\frac{1}{6}\ \sigma\ bd^5$

(ii) $\frac{1}{6}\ \sigma\ bd^4$

(iii) $\frac{1}{6}\ \sigma\ bd^3$

(iv) $\frac{1}{6}\ \sigma\ bd^2$

(e) A cantilever beam of length (l) carries a uniformly distributed load of intensity ω per unit length over whole span. The slope at its fixed end will be

(i) zero

(ii) $\omega l^3/6$ EI

(iii) $\omega l^4/6$ EI

(iv) $\omega l^4/8$ EI

(f) A shaft revolving at N rpm transmits torque (T) in kNm. The power developed is

(i) 2π NT kW

(ii) 2π NT/60 kW

(iii) 2π NT/120 kW

(iv) 2π NT/30 kW

(g) The slenderness ratio of a long column is

(i) 10 – 20

(ii) 20 – 30

(iii) 50 – 60

(iv) above 80

2. Two parallel walls are stayed together by a steel rod, 10 cm in diameter, passing through metal plates and nuts at both ends. The nuts are tightened, when the rod is at 125°C, to keep the walls 5 m apart. Determine the stresses in the rod when the temperature falls down to 25°, if the ends do not yield.

Take $E = 2 \times 10^5$ N/mm^2, $\alpha = 12 \times 10^{-6}$ K^{-1}. *14*

3. At a point in a material, there is a horizontal tensile stress of 50 N/mm^2, a vertical tensile stress of 30 N/mm^2 and shearing stress of 25 N/mm^2 as shown in Figure 1. Determine the maximum and minimum principal stress and the plane on which they act. Also determine the magnitude of maximum shearing stress. *14*

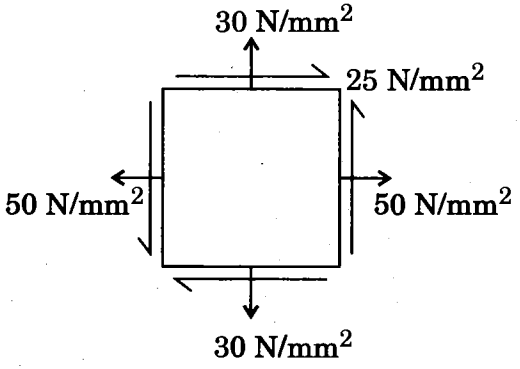

Figure 1

4. A simply supported beam AB of span L is carrying a uniformly distributed load w per unit length over the entire span as shown in Figure 2. Draw the shear force and bending moment diagrams. Also determine the maximum value of shear force and bending moment. *14*

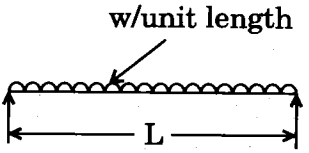

Figure 2

5. A rectangular beam of breadth 120 mm and depth 250 mm is simply supported over a span of 5 m. The beam is loaded with a uniformly distributed load of 8 kN/m over the entire span. Find the maximum bending stresses. Also draw the bending stress distribution diagram. *14*

6. A cantilever beam AB of span L is carrying a concentrated load W at the free end B as shown in Figure 3. Calculate the slope and deflection at the ends A and B. *14*

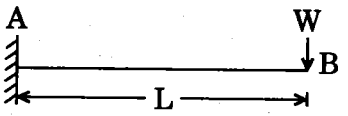

Figure 3

7. Calculate the diameter of a solid shaft transmitting 120 kW at 20 rpm, if the maximum stress in the shaft is not to exceed 60 MPa. *14*

8. A steel bar of rectangular section 36 mm $\times$ 50 mm pinned at each end is 5 m long. Determine the buckling load when it is subjected to axial compression using Euler's expression.
Take $E = 2 \times 10^5$ N/mm^2. *14*