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BET-022

Diploma in Civil Engineering (DCLE (G))
Diploma in Mechanical Engineering (DME)
DCLEVI/DMEVI/DELVI/DECVI/DCSVI/ CCLEVI/ACMEVI/ACELVI/ACECVI/ACCSVI

Term-End Examination

December, 2013

BET-022 : STRENGTH OF MATERIALS

ne : 2 hours *Maximum Marks : 70*

te : *Question no. **1** is **compulsory**. Attempt **any four** questions from the remaining. Use of scientific calculator is **permitted**.*

Choose the correct alternative : **7x2=14**

(a) The relation between Young's Modulus E, Modulus of rigidity G, and Poission's ratio μ is given by :

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

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

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

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

(b) If the principal stresses in a strained body are p_1 and p_2 ($p_1 > p_2$), then the normal stress on a plane carrying the maximum shear stress is equal to :

(i) $\sqrt{p_1^2 + p_2^2}$ (ii) $\frac{p_1 + p_2}{2}$

(iii) $\frac{\sqrt{p_1^2 - p_2^2}}{2}$ (iv) $\sqrt{p_1^2 - p_2^2}$

(c) Maximum bending moment in a beam occurs where :

(i) Deflection is zero

(ii) Shear force is minimum

(iii) Shear force changes sign

(iv) Shear force is maximum

(d) The relationship between maximum shear stress and average shear stress in a rectangular section can be expressed as :

(i) $\tau_{max} = 0.5\tau_{av}$

(ii) $\tau_{max} = 1.0\tau_{av}$

(iii) $\tau_{max} = 2.0\tau_{av}$

(iv) $\tau_{max} = 1.5\tau_{av}$

(e) A simply supported beam of span L carries a concentrated load w at mid span. The maximum deflection will occur at :

(i) mid span

(ii) either ends

(iii) at one third of either end

(iv) at one fourth of any one end

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

(i) $2\pi NT$ kW

(ii) $2\pi NT/60$ kW

(iii) $2\pi NT/30$ kW

(iv) $2\pi NT/120$ kW

(g) A column of length l is fixed at its both ends. Its equivalent length will be equal to :

(i) $1\,l$ (ii) $0.707\,l$

(iii) $0.5\,l$ (iv) $2\,l$

2. A steel rod circular in cross-section, tapers from 30 mm diameter to 150 mm diameter in a length of 1 meter. Find how much of this length will increase under a pull of 30 kN if modulus of elasticity, $E = 2.10 \times 10^5 N/mm^2$. **14**

3. At a point in a material, there is a horizontal tensile stress of $200N/mm^2$ a vertical tensile stress of $100N/mm^2$ and shearing stress of $250N/mm^2$ as shown in figure -1. Determine the maximum and minimum principle stress and the plane on which they act. Determine also the magnitude of maximum shearing stress. **14**

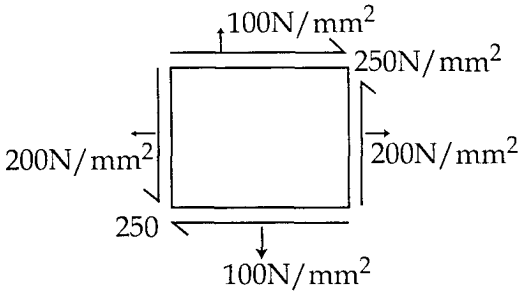

Figure - 1

4. Draw the shear force and bending moment diagram for the simply supported beam as shown in figure-2. 14

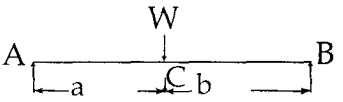

Figure - 2

5. Determine the slope and deflection at the free end and fixed end of a cantilever beam of span L carrying uniformly distributed load of w per unit length over the entire span as shown in figure-3. 14

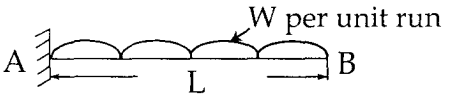

Figure - 3

6. A timber beam 150 mm wide and 350 mm deep is simply supported over a span of 5m. 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. Show that the ratio of torque of hollow shaft to that of solid shaft is 1.94 for the same weight, material and maximum shear stress. 14

8. A tabular strut 225 cm long having outer and inner diameter of 37.5 mm and 32.5 mm respectively loaded through pin joints at both ends. Calculate the crippling load by Euler's formula. Assume, $E = 2 \times 10^5 N/mm^2$. 14