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BET-022

DIPLOMA IN CIVIL ENGINEERING (DCLE-G) / DIPLOMA IN MECHANICAL ENGINEERING (DME)

Term-End Examination,

December 2019

BET-022 : STRENGTH OF MATERIALS

Time : 2 Hours] *[Maximum Marks : 70*

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*Note : (i) Question No. 1 is **compulsory**.*

*(ii) Attempt **any four** more questions from the remaining questions.*

*(iii) All questions carry **equal** marks.*

(iv) Use of scientific calculator is permitted.

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

a) Poisson's ratio may be defined as

(i) The ratio of Lateral strain to Longitudinal strain

(ii) The ratio of Longitudinal strain to Lateral strain.

(iii) The ratio of Longitudinal strain to Stress.

(iv) The ratio of Lateral strain to Stress.

b) Principal planes are the planes on which the stress is
   (i) Only shear stress
   (ii) Only Normal stress
   (iii) Only Tangential stress
   (iv) Only Temperature stress

c) The maximum bending moment in a simply supported beam of span L and carrying a concentrated load W at mid span is

   (i) WL (ii) $\frac{WL}{2}$

   (iii) $\frac{WL}{4}$ (iv) 2WL

d) The slope of a simply supported beam of span L carrying a concentrated load W at the centre is
   (i) $WL^2/6EI$ (ii) $WL^2/8EI$
   (iii) $WL^2/12EI$ (iv) $WL^2/16EI$

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

   (i) $\frac{2\pi NT}{60}$kW (ii) $\frac{2\pi NT}{30}$kW

   (iii) $\frac{2\pi NT}{15}$kW (iv) $2\pi NT$ kW

f) The slenderness ratio of a long column is
   (i) Less than 80 (ii) Above 80
   (iii) 50 to 60 (iv) 20 to 30

g) 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) $\tau_{max} = 1.5\ \tau_{av}$ (iv) $\tau_{max} = 2.0\ \tau_{av}$

2. In separate experiments, Young's modulus and Rigidity modulus of a material have been determined as 250 GPa and 100 GPa respectively. Calculate the Poisson's ratio and Bulk modulus of the material. 14

3. At a point in a material, there is a horizontal tensile stress of 1000N/mm^2, a Vertical tensile stress of 400N/mm^2 and Shearing stress of 600N/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

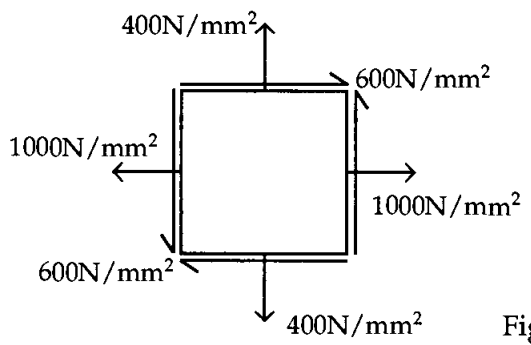

Figure 1

4. Draw the shear force and bending moment diagram for a simply supported beam of span l carrying two point loads at a distance $\frac{l}{4}$ from each support as shown in Figure 2. Also determine the value of maximum bending moment. 14

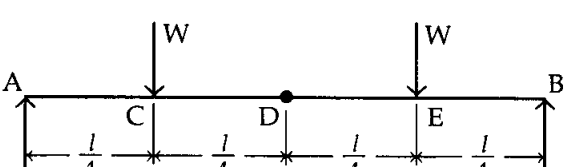

Figure 2

5. Determine the slope and deflection at the free end of a cantilever beam of span l carrying a uniformly distributed load of W per unit length over the entire span as shown in Figure 3. 14

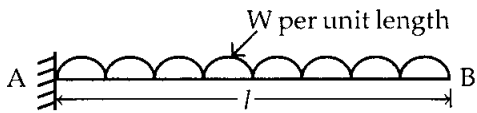

Figure 3

6. A rectangular beam of breadth 120mm and depth 240mm is simply supported over a span of 5m. The beam is loaded with uniformly distributed load of 4kN/m. Find the maximum bending moment. 14

7. A Tubular strut 450cm long having outer and inner diameter 75 mm and 65 mm respectively loaded through pin joints at both ends. Calculate the crippling load by Euler's formula. Assume $E = 2\times10^5$ N/mm^2. 14

8. Write short notes on **any two** of the following topics. $2\times7=14$

   a) Types of supports

   b) Hardness

   c) Hooke's law

   d) Ductility