[Total No. of Questions - 9] [Total No. of Printed P s - 4]
(2126)

16093(D) - 9 DEC 2016

B. Tech 3rd Semester Examination

Strength of Materials-I (CBS)

ME-301

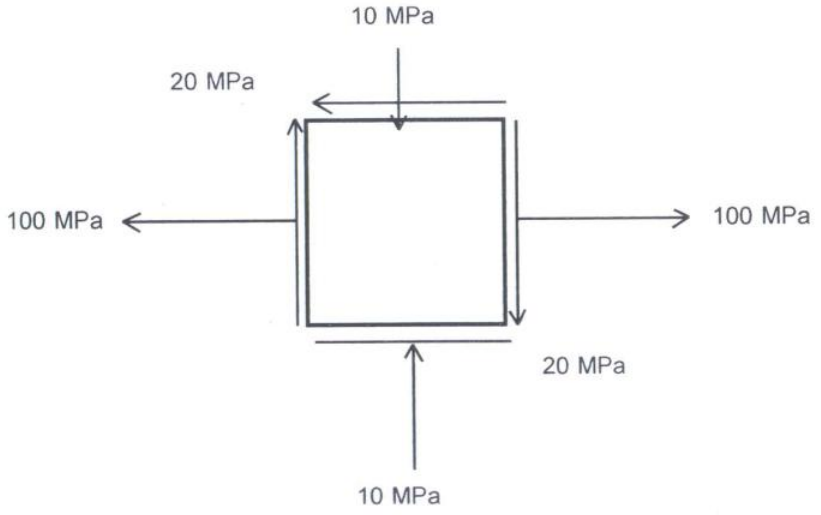
Time : 3 Hours **Max. Marks : 60**

The candidates shall limit their answers precisely within the answer-book (40 pages) issued to them and no supplementary/continuation sheet will be issued.

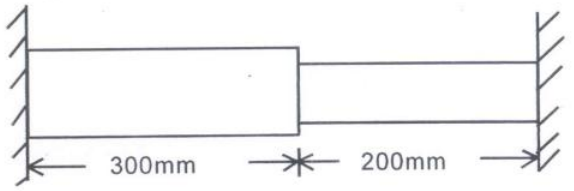
Note : Attempt five questions in all selecting one question from each sections A, B, C and D. Section E is compulsory.

SECTION - A

1. Stresses on two perpendicular planes are shown below. Find the maximum shear stresses and the planes on which these stresses act. (10)



2. A composite bar is rigidly attached to two supports. The left portion of the bar is copper of uniform cross sectional area 7500 mm^2 and length 300 mm. The right portion is aluminium of uniform cross sectional area 2000 mm^2 and length 200 mm. If the temperature of assembly is increased by 30° Celsius, find the stress induced in both the materials. E_c = 120 GN/m^2 $\alpha_c = 20\times10^{-6}$ E_a = 200GN/m^2 $\alpha_s=10\times10^{-6}$. (10)



SECTION - B

3. A timber beam having a cross section 140 mm wide and 180 mm deep is reinforced by 40 mm wide and 10 mm deep steel plates at top and bottom of the beam. The beam is simply supported and carries a 5kN/m uniformly distributed load over the entire span of 6m. Find maximum stress in steel and timber. (10)

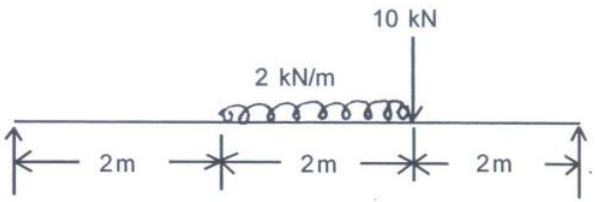
4. (a) Compare the resistance to torsion of a hollow shaft to that of a solid shaft if the inside diameter of the hollow shaft is two third of the external diameter and the two shafts are of same material, weight and length. (5)

   (b) Deduce the torsion equation stating the assumptions made. (5)

SECTION - C

5. Derive the formulae for finding out shear stresses in beams. Show the shear stress distribution on a circular cross-section. (10)

6. Find deflection under the point of application of point load in the beam shown below. (10)



SECTION - D

7. (a) Explain middle third rule for short rectangular columns. (5)

   (b) Show the graphical representation of various theories of failure. (5)

8. A simply supported beam is carrying a uniformly distributed load of 2 kN/m over a span of 6 m. Find maximum deflection with the help of strain energy method. (10)

SECTION - E

9. (i) Explain complimentary shear stress.

   (ii) Find value of principal stress in case of shaft of diameter d subjected to bending moment M and torque T.

   (iii) Derive expression for deflection in case of close coiled helical spring under axial loading.

   (iv) Derive relationship between modulus of elasticity and bulk modulus

   (v) Find deflection of free end of cantilever of length / supporting a point load W at free end by moment area method.

   (vi) State Castigliano's theorem.

   (vii) Explain maximum strain energy theory.

   (viii) Draw stress strain diagram for a ductile material and name all the important points.

   (ix) Give the ratio of maximum shear stress and average shear stress in a beam of rectangular cross section.

   (x) Derive the formula for strain energy in the shaft under torsion. (2×10=20)