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Reg. No. : .....
Name : .....

Third Semester B.Tech Degree Examination, April/May 2012
(2008 Scheme)
08.304 : MECHANICS OF SOLIDS (MPU)

Time: 3 Hours Max. Marks: 100

Instructions : *Answer **all** questions from Part **A**. From Part **B**, answer **one** question from **each** Module. Graph sheets may be supplied on request.*

PART – A 40

1. Explain :
   i) Hooke's law; ii) Poission's ratio.
2. Define 'Mohr's circle'. What are its uses ?
3. Derive the relationship between modulus of elasticity and modulus of rigidity.
4. Derive the relationship between intensity shear force and bending moment.
5. Explain the assumptions made in the theory of simple bending.
6. Explain the principle used in compound cylinders.
7. Define 'core of section'. Determine the core of a rectangular section of size 'a × b'.
8. Explain Lame's equation.

PART – B

Module – 1 20

9. The state of stress at a point in a strained material is 120 MPa (tensile) upon a horizontal plane and 180 MPa (tensile) upon a vertical plane. These planes also carry a shear stress of 80 MPa. Determine graphically :
   i) The magnitude of major and minor principal stresses; and
   ii) The magnitude of maximum shear stress. Define principal plane and principal stress.

P.T.O.

10. A tapering steel rod of length 500 mm has a diameter of 20 mm at one end and 40 mm at the other end. The rod is held between two unyielding supports at room temperature. What is the maximum stress induced in the rod, if temperature rises by 30°C ? $E_s = 2 \times 10^5$ N/mm^2; $\alpha_s = 12 \times 10^{-6}$/°C. Derive the expression used.

Module – 2

20

11. A cast iron beam has a T – section with top flange 100 mm × 12 mm and web 88 mm × 12 mm. Draw the shear stress distribution across the depth marking the values at all salient points. Shear force at the cross section = 20 kN.

12. A simply supported beam PQ of span 6 m carries :

    i) a point load of 30 kN at R (which is at a distance of 1.2 m from P);

    ii) a point load of 40 kN at S (which is at a distance of 1.5 m from Q). Determine the position and magnitude of maximum deflection by Macaulay's method.

Module – 3

20

13. A rectangular pier ABCD is subjected to a compressive load of 450 kN at P. The co-ordinates of the various points are as follows : A(0, 0) ; B (1500, 0); C (1500,1000); D (0,1000), P (1000, 750). Find the combined direct and bending stresses at A and C.

14. Determine the forces in the various members of the truss shown in figure.