PAPER ID : 4067

TME-303 **Printed Pages : 3**

Paper ID and Roll No. to be filled in your Answer Book

Roll No.

B. Tech.

(SEM. III) (ODD SEM.) (REG. & BACK) EXAMINATION, 2012-13

SOLID MECHANICS

Time : 3 Hours] [Total Marks : **100**

Note : (1) Answer all questions.
(2) Assume any missing data suitably.

1 Attempt any four questions : **5×4=20**

(a) Draw the stress strain diagram for copper and explain the various points on it.

(b) Give the various mechanical properties of materials and explain any four of them.

(c) State any four assumptions made in the theory of simple bending.

(d) Explain equilibrium equations.

(e) Using Mohr's circle method, find the principal stress when the element is subjected to a state of pure shear stresses of value 'q'.

(f) Define principal plane and principal stress.

2 Attempt any two questions : **10×2=20**

(a) A cantilever beam of uniform cross section is loaded by a concentrated force at its tip. Determine the deflection under point of application of the force by using Castigliano's theorem.

(b) A thin walled tube with an internal diameter of 35 cm and a wall thickness of 6mm is subjected to an internal pressure of 70 kg/cm^2, an axial tensile load of 10000 kg and a twisting moment. The yield point stress in tension is 2800 kg/cm^2. Determine the maximum twisting moment that can be applied, based on the maximum shear stress theory.

(c) Compare the permissible diameter of the steel circular shaft, subjected to torsion, according to the following theories of failure :

(i) Maximum shear stress theory

(ii) Maximum strain energy theory.

3 Attempt any two questions : **10×2=20**

(a) A simply supported prismatic beam of length 'L' and supported on its both ends, carries a uniformly distributed load 'w' per unit length. Determine the equation of elastic curve and the maximum deflection of the beam.

(b) A steel shaft must transmit 150 kW at speed of 360 rpm. Knowing that G = 77.2 GPa, design a solid shaft so that the maximum shearing stress will not exceed 50 MPa and the angle of twist in a 2.5 m length must not exceed 3°.

(c) Draw the shear force and bending moment diagram for a simply supported beam of length 'L' carrying a uniformly varying load of intensity 'w' at one end and zero at another end.

4 Attempt any two questions : **10×2=20**

(a) A 20 mm diameter rod made of an experimental plastic is subjected to a tensile force of magnitude P = 6 kN. Knowing that an elongation of 14 mm and decrease in diameter of 0.85 mm are observed in a 150 mm length, determine the modulus of elasticity, the modulus of rigidity and Poisson's ratio for the material.

(b) Tensile stress of 160 MPa and 40 MPa are acting on two perpendicular planes in a body. Determine the location of a plane on which the resultant stress is most inclined to its normal.

(c) A circular bar is to withstand a bending moment of 10 kN.m and a torque of 30 kN.m. Determine the diameter of the bar if the yield stress of the material is 250 MPa and the factor of safety is 2. Use maximum normal strain theory of failure. Take Poisson's ratio as 0.3.

5 Write short notes on any four questions : **5×4=20**

(a) True stress strain curve

(b) Superposition theorem

(c) Reciprocity theorem

(d) Isotropic materials

(e) Transverse shear

(f) Mohr's circle.
