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Total Number of Pages: 1

M.TECH  
CEPC101/GEPE102

**1st Semester Regular/Back Examination – 2014**

**THEORY OF ELASTICITY AND PLASTICITY**

**BRANCH(S): STRUCTURAL & FOUNDATION ENGINEERING, STRUCTURAL  
ENGINEERING, GEO TECHNICAL ENGG**

**Time: 3 Hours**

**Max marks: 70**

**Answer Question No.1 which is compulsory and any five from the rest.  
The figures in the right hand margin indicate marks.**

- Q1 Explain the following very shortly. (2 x 10)
- a) Torsional rigidity
  - b) Polar coordinates
  - c) Boundary value problem
  - d) Principal plane
  - e) Stress tensor
  - f) Constitutive relations
  - g) Membrane analogy
  - h) Slip lines
  - i) Plastic flow
  - j) Flow rule
- Q2 Distinguish between plane stress problem and plane strain problem with suitable examples and figures. Derive the relations for axial and shear strains for a plane strain problem. (5+5)
- Q3 Derive the horizontal and vertical components of deflection of a cantilever beam loaded uniformly throughout its length (10)
- Q4 What are conditions of compatibility? Derive the conditions for compatibility for an element subjected to three dimensional stresses (3+7)
- Q5 What is a profile section? Derive the relation for shear stress for a narrow rectangular cross section of depth  $b$  and width  $c$  subjected to a twisting moment (3+7)
- Q6 Derive the relation for normal and shear stresses for a circular cylinder subjected to uniform internal pressure in terms of stress function. (10)
- Q7 Develop the differential equation of equilibrium in three dimensions of a rectangular element and then reduce the equation for plane stress condition. (10)
- Q8 Write short notes on the followings. (5 x 2)
- a) Tresca's yield criteria
  - b) Saint-Venant principle
  - c) Airy's stress function

