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Question Paper Code :

ANIL NEERUKONDA INSTITUTE OF TECHNOLOGY & SCIENCES

(AUTONOMOUS)

M.E/M.Tech I-Semester Regular Examinations, November 2015

THEORY OF ELASTICITY AND PLASTICITY

(MACHINE DESIGN)

Date:

Time: 3 hours

Max Marks: 60

Answer ONE Question from each Unit

All Questions Carry Equal Marks

All parts of the question must be answered in one place only

UNIT-I

1. a) Define and explain the terms plane stress & plane strain with Examples ? 4M
- b) Distinguish between isotropic & anisotropic materials with Suitable examples? 4M
- c) Briefly discuss about principal planes and principal stresses and stress invariants 4M

OR

2. a) What is meant by compatibility? Derive the equations of compatibility for rectangular Coordinatesystem 6M
- b) Derive Airy's stress function and investigate what problems can be solved by using stress function. 6M

UNIT-II

- 3 a) Derive the equations of equilibrium and strain displacement relations in polar Coordinates 6M
- b) Obtain an expression for hoop stress induced in a thick cylinder subjected to internal fluid pressure using general solution satisfying
 $\Delta^4 \phi = 0, \phi = A \log r + B r^2 \log r + C r^2 + D$ 6M

OR

4. The State of Stresses at a point in a solid body is defined by $\sigma_x = 40$ MPa , $\sigma_y = 20$ MPa, $\sigma_z = 30$ Mpa, $\tau_{xy} = 10$ MPa, $\tau_{xz} = 15$ MPa, $\tau_{yz} = - 30$ MPa. Determine the normal stress at the point on a plane for which the normal is $(l,m,n) = (0.5,0.5,0.707)$. 12M

UNIT-III

- 5) a) write short notes on i) uniqueness of solution
ii) Reciprocal theorem 6M

- b) A cantilever beam of narrow rectangular cross section carries a point load at the free end. Derive the expressions for the stress components at any point in the cross section of the beam. compare the results with those obtained from elementary strength of materials. Evaluate the vertical deflection at the free end and explain the shear effect. 6M

OR

- 6) a) In a displacement field is represented by $u = x^2 - xy + y^2$ and $v = -x^2 + xy - y^2$. Determine normal and shear stresses $\epsilon_x, \epsilon_y, \gamma_{xy}$ at a point $x=1$ and $y=0.5$. 6M
- b) Derive the expressions for differential equations of equilibrium and compatibility equation in a two dimensional coordinate system of forces. 6M

UNIT-IV

- 7) a) Discuss the yield criteria and the flow rules for perfectly plastic and strain hardening materials. 6M
- b) Explain the creep stress and deformation. 6M

OR

- 8) a) Discuss about stress relaxation of deformation ? 6M
- b) Explain the following theories of plastic flow in materials 6M
- i) Henky's theory ii) Maxwell's heury

UNIT-V

- 9) a) Give the details of characteristic method 6M
- b) Explain about compression of metal under pressure? 6M

OR

- 10) a) Discuss about Engineering method? 6M
- b) Explain about characteristic method for solving a practical problem encountered in plastic deformation. 6M