Hall Ticket No: | | | | | | | | | | | **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) Differentiate plane stress & plane strain problem. Give the associated Stress and corresponding train relationship ? 4M

   b) The stress components at a point in a body subjected to two dimensional state of stresses are given by $б_x = 2x^2y+3xy$; $б_y=2x^3+5xy^2$; $\tau_{xy}=4x^2y^2$.Determine weather the equations of equilibrium are satisfied at the point (-2, 3). If not, determine the suitable body force required at this point so that these stress components come under equilibrium. 8M

OR

2. a) What is meant by compatibility? Derive the equations of compatibility for rectangular Coordinate system 6M

   b) Define Airy's stress function and investigate what problems of plane stress can be solved by the stress function

$$Ø = 3F/4C\left(xy-(xy^3/3C^2)\right) + \left(P/2\right)y^2$$ 6M

UNIT-II

3 a) Derive the equations of equilibrium and strain displacement relations in polar Coordinates 6M

   b) If a displacement field is described by

$$u= (-x^2+2y^2+6xy)10^{-4} \quad , \quad v= (3x+6y-y^2)\,10^{-4}$$

   Determine $Є_x, Є_y, \gamma_{xy}$ at the point x=1,y=2 6M

OR

4. The stress tensor at a point is given by

$$\begin{vmatrix} 1050 & -210 & 70 \\ -210 & -350 & 0 \\ 70 & 0 & -700 \end{vmatrix}$$ KPa 12M

Determine a) Principal stresses at the point
b) Direction of the maximum principal stress
c) Deviatoric and spherical stress tensors

UNIT-III

5) a) State and prove uniqueness and reciprocal theorem 6M

b) A rectangular beam of dimensions 200mm x 300mm is used as a simply supported beam carrying a uniformly distributed load of W ton/m. what is the maximum value of 'W' if the maximum shear stress developed in the beam section is 5MPa and span is 6mts. 6M

OR

6) a) In a displacement field is represented by $u = x^2-xy+y^2$ and $v = - x^2 +x+y-y^2$. $w=2x2-x+y+y^2$. Determine normal and shear stresses ϵ_x, ϵ_y, ϵ_z γ_{xy} , γ_{yz}, γ_{zx} at a point (3,2,1). 6M

b) A cantilever beam of 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. Compare the results with those obtained from strength of materials. 6M

UNIT-IV

7) a) Write a short note on i) Platic deformation of metals
ii) Twinning 6M

b) Explain the creep stress and deformation. 6M

OR

8) a) Discuss about stress relaxation of deformation ? 6M

b) Discuss with an example about tresca yield criterion and vonmises yield criterion and constant strain energy criterions and how it is useful to solve plasticity problems of 1D and 2D.
6M

UNIT-V

9) a) Derive the relations for characteristic method and engineering method and discuss their significance. 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