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SIDDHARTH INSTITUTE OF ENGINEERING & TECHNOLOGY:: PUTTUR
(AUTONOMOUS)**M.Tech I Year I Semester (R16) Regular Examinations January 2016****THEORY OF ELASTICITY**

(Structural Engineering)

(For Students admitted in 2016 only)

Time: **3 hours**Max. Marks: **60**(Answer all Five Units **5 X 12 =60** Marks)**UNIT-I**

- Q.1** a. Explain the Plane Stress and Plane strain problems with suitable examples. 8M
b. Explain the significance of boundary conditions. 4M

OR

- Q.2** a. Derive the differential equations of equilibrium for a state of plane stress problem. 8M
b. Obtain the compatibility equations for a plane strain problems. 4M

UNIT-II

- Q.3** Investigate the type of problem solved by $\phi = -\frac{F}{d^2}xy^2(3d-2y)$ 12M

OR

- Q.4** a. State and explain the Saint-Venant's Principle. 6M
b. Explain the procedure to obtain the solution of 2D-problems in the form of Fourier series. 6M

UNIT-III

- Q.5** Derive the governing partial differential equation to get the solutions of 2D-problems in polar coordinates. 12M

OR

- Q.6** Derive the displacement components of a curved prismatic member of narrow rectangular cross-section subjected to pure bending 'M'. 12M

UNIT-IV

- Q.7** Determine the principal stresses and maximum shear stress if the state of strain at a point in a strained 3D-Steel structural component is 12M

$$\begin{bmatrix} 300 & 600 & 450 \\ 600 & 450 & 375 \\ 450 & 375 & 300 \end{bmatrix} \times 10^{-6}$$

OR

- Q.8** Explain the following:
(a) Stress Invariants 5M
(b) Conditions of Compatibility for 3-D state of stress 7M

UNIT-V

Q.9 Determine the magnitude of the maximum shear stress developed if a shaft of an elliptical cross-section is subjected to a twisting moment ' T '. Also find the angle of twist. 12M

OR

Q.10 a. Explain the membrane analogy to get the solution of torsional problems. 8M
b. Explain the behavior of a shaft of rectangular cross-section subjected to torsion. 4M