

**GUJARAT TECHNOLOGICAL UNIVERSITY****M.E –I<sup>st</sup> SEMESTER–EXAMINATION – JULY- 2012****Subject code: 710901N****Date: 05/07/2012****Subject Name: Theory of Elasticity****Time: 2:30 pm – 05:00 pm****Total Marks: 70****Instructions:**

1. Attempt all questions.
2. Make suitable assumptions wherever necessary.
3. Figures to the right indicate full marks.

- Q.1** (a) Write a note on body force, shear force and stress vector. **07**  
 (b) What do you understand by principal stresses? Explain it with graphical representation. **07**
- Q.2** (a) Derive the expressions for the thick cylinder subjected to internal and external pressures. **07**  
 (b) What do you understand by axisymmetric problems and discuss its effect for stress and strain. **07**
- OR**
- (b) Derive the expressions for the normal stresses in a straight beams due to the thermal loading **07**
- Q.3** (a) State second theorem of Castigliano and explain with appropriate mathematical expressions **07**  
 (b) What do you understand by Reciprocal relation and explain Maxwell-Betti-Rayleigh reciprocal theorem. **07**
- OR**
- Q.3** (a) What is the significance of compatibility conditions. **07**  
 (b) Explain plane state of strain with its mathematical expressions **07**
- Q.4** (a) Discuss thermoelastic stress-strain relations, equations of equilibrium and strain-displacement relations if thermal stresses are considered **07**  
 (b) Explain Kirchhoff's theorem **07**
- Q.4** (a) What is the significance of Octahedral stresses **07**  
 (b) Explain plane state of stress with its mathematical expressions **07**
- Q.5** (a) The state of stress at a point is such that  $\sigma_x = \sigma_y = \sigma_z = \tau_{xy} = \tau_{yz} = \tau_{zx} = \rho$ . Determine the principal stresses and their directions. **07**  
 (b) Explain stress components on an arbitrary plane. **07**
- Q.5** (a) Explain Mohr's circle for the three-dimensional state of stress. **07**  
 (b) What is the significance of Theorem of virtual work **07**