(Pages : 2) **B – 2790**

Reg. No. : .....

Name : .....

First Semester M.Tech. Degree Examination, December 2016
Branch : Civil (2008 Scheme)
Structural Engineering
Structural Engineering and Construction Management
CSC 1005 : THEORY OF ELASTICITY

Time : 3 Hours Max. Marks : 100

Instructions : *1) Answer* ***any five*** *questions.*

2) ***All*** *questions carry* ***equal*** *marks.*

1. a) Find the principal stresses and principal planes in the following stress field. **15**

$$[\sigma] = \begin{bmatrix} 4 & 6 & 2 \\ 6 & 8 & 12 \\ 2 & 12 & 10 \end{bmatrix} \text{ MPa}$$

b) Derive the strain displacement relations in 2D Cartesian coordinates. **5**

2. a) State St. Venant's principle. **15**

b) Derive the compatibility equations for strains in a 3D field. **5**

3. a) Find the stresses in a cantilever subjected to a tip load P. Length of the beam = L, flexural rigidity = EI. Thickness = 2C. **14**

b) Derive the expressions for displacements in the above case and compare with strength of materials solution. **6**

4. a) Derive the equilibrium equations for a 2D polar coordinate problem in elasticity. **10**

b) Analyze a thick cylindrical shell subjected to internal and external pressures. **10**

5. An elliptic cross section bar is subjected to torque. Derive the expressions for stresses and warping displacement. **20**

6. a) Derive the Lame-Navier equation for equilibrium in terms of displacements. Assume plane stress conditions. **15**

b) What are the different types of boundary conditions in elasticity ? Explain. **5**