22231

M. Tech. 2nd Semester (Mechanical Engg.)
(Machine Design) Examination, May–2015
THEORY OF ELASTICITY
Paper–M-802-A

Time allowed : 3 hours] *[Maximum marks : 100*

Note : *All questions carry equal marks. Attempt any five questions.*

1. Define principal stresses and principal directions. Show that the determination of principal stresses and principal directions reduces to the solution of an Eigen value problem. Discuss the existence of three real valued solutions for principal stresses. 20

2. (a) Explain the compatibility conditions and their physical significance. Derive Beltrami-Mitchell compatibility equation in plane strain. 10

   (b) Derive the equations of Equilibrium in 2D case. 10

3. Discuss two dimensional elasticity problems in polar coordinates with example. 20

4. (a) Derive the stress components of a rotating circular disc of uniform thickness with a central hole of radius 'a'. 10

(b) Derive Lame's equations for a thick walled cylinder subjected to internal and external pressures. 10

5. Sketch the stress-strain distribution for elastic plastic yielding of a cantilever. Also calculate the bending moment in the elastic-plastic state. The beam has rectangular cross section with width b and height h. 20

6. Explain the torsion of thick rectangular section. 20

7. Discuss the complex stress function and corresponding displacements with suitable example. 20

8. Write short notes on the following : 20

(a) Mohr's circle

(b) Idea of an edge dislocation

(c) Application of energy method to torsion problem.