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# Manipal Institute of Technology, Manipal

(A Constituent Institute of Manipal University)



## I SEMESTER M.TECH (STRUCTURAL ENGINEERING) END SEMESTER EXAMINATIONS, NOV/DEC 2015

### SUBJECT: ADVANCED MECHANICS OF SOLIDS [CIE 541]

#### **REVISED CREDIT SYSTEM**

Time: 3 Hours

MAX. MARKS: 50

#### Instructions to Candidates:

- ✤ Answer ANY FIVE FULL the questions.
- Missing data may be suitable assumed.

1A.	Considering the six stress components and the three body forces acting on a body in rectangular co-ordinate system, derive the equilibrium conditions.				
1B.	The data from a Delta rosette are given as $\varepsilon_{0^{\circ}} = 240 \times 10^{-6}$ ; $\varepsilon_{60^{\circ}} = 240 \times 10^{-6}$ and $\varepsilon_{120^{\circ}} = -360 \times 10^{-6}$ . Find the principal strains and their directions.				
2A.	State of stress at a point in a strained body in terms of rectangular component is given below. Determine the three principal stresses and associated principal planes. $\sigma = \begin{bmatrix} 25 & -45 & -65 \\ -45 & 45 & 25 \\ -65 & 25 & -25 \end{bmatrix} MPa.$	10			
3A.	Derive the Saint Venant's equations of strain compatibility (3D).				
<b>3B.</b>	Given $\phi = ax^2 - by^2$ . Check whether this function can be used as stress function for zero body forces and find out the problem represented.				
4A.	Determine the radial and tangential stresses for the axisymmetric problem of a curved beam subjected to pure bending.				
<b>4B.</b>	Obtain the equations of equilibrium for an axis symmetrically loaded circular plate.	04			
5A.	For a rectangular plate element, obtain the expressions for stress and stress resultants in terms of plate curvature.				
5B.	Using Navier's solution, for a simply supported plate subjected to concentrated load 'P' at co-ordinate (s,p), obtain the expression for elastic surface.				
6A.	Obtain the expressions for stress resultants in a shell element of a thin shell, in terms				
	For a rectangular plate give the boundary conditions for (a) fixed support and (b) free				
0В.	edge.	νŦ			