Reg. No.										

MANIPAL INSTITUTE OF TECHNOLOGY
MANIPAL
A Constituent Institution of Manipal University

I SEMESTER M.TECH. (CIVIL ENGINEERING)

END SEMESTER EXAMINATIONS, NOVEMBER 2017

SUBJECT: ADVANCED MECHANICS OF SOLIDS [CIE 5151]

REVISED CREDIT SYSTEM
(16/11/2017)

Time: 3 Hours MAX. MARKS: 50

Instructions to Candidates:

- Answer **ALL** the questions.
- Missing data may be suitable assumed.

1A.	The general displacement fields in a body in Cartesian coordinate system is given by $u = 3x^2y^2z + y^2z$; $v = 3xyz + xy$; $w = 4xyz^2 + 5xy^2$. Find strain tensor and the linear strain at the point (2, -1, 3) in the direction (0.6, 0.53, -0.6).	**4**
1B.	Derive the Saint Venant's equations of compatibility for a given displacement field in 3D.	**6**
2.	State of stress at a point in a strained body is given: $\sigma = \begin{bmatrix} 25.65 & 46.88 & 22.06 \\ 46.88 & 54.05 & -12.4 \\ 22.06 & -12.4 & 102.66 \end{bmatrix} MPa$ Determine the three principal stresses and associated principal planes.	**10**
3A.	Given $\phi = ax^2 - bxy - cy^2$. Check whether this function can be used as stress function for zero body forces and find out the problem represented.	**5**
3B.	For a thin rectangular plate subjected to uniformly distributed load, obtain the expressions for shear forces in terms of vertical displacement 'w'.	**5**
4A.	Derive the stress compatibility conditions for plane strain condition (2D).	**6**
4B.	Using Navier's solution, for a simply supported plate subjected to strip loading 'q_o' (parallel to X-axis) at distance 'p' from X-axis, obtain the expressions for deflection.	**4**
5A.	An annular circular plate simply supported at outer edges is subjected to edge moments M_1 at the inner edge (r = b) & M_2 at outer edge (r = a). Obtain the expressions for deflection and moment.	**5**
5B.	Using membrane theory of cylindrical shells, obtain the equilibrium equations.	**5**