Reg. No. ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐

MANIPAL INSTITUTE OF TECHNOLOGY

MANIPAL

A Constituent Institution of Manipal University

I SEMESTER M.TECH. (STRUCTURAL ENGINEERING)

END SEMESTER EXAMINATIONS, JAN 2017

SUBJECT: ADVANCED MECHANICS OF SOLIDS [CIE 5151]

REVISED CREDIT SYSTEM
(/01/2017)

Time: 3 Hours   MAX. MARKS: 50

Instructions to Candidates:

❖ Answer **ALL** the questions.

❖ Missing data may be suitable assumed.

1A.	For plane stress case, obtain the stress components in term of strain components.	5
1B.	The data from a Delta rosette are given as $\epsilon_{0°} = 330 \times 10^{-6}$; $\epsilon_{60°} = 240 \times 10^{-6}$ and $\epsilon_{120°} = -300 \times 10^{-6}$. Find the principal strains and their directions.	5
2.	State of stress at a point in a strained body is given: $\sigma = \begin{bmatrix} 20 & -40 & -65 \\ -40 & 50 & 20 \\ -65 & 20 & -25 \end{bmatrix} MPa$. Determine the three principal stresses and associated principal planes.	10
3A.	Analyze for stresses in a cantilever beam subjected to pure bending considering the Airy's stress function $\phi = Dy^3$. Take origin at fixed support.	5
3B.	Determine the radial and tangential stress for a hollow cylinder subjected to uniform pressures at inner edge of 'σ_i' and at outer edge of 'σ_o'. The inner radius is 'a' and outer radius is 'b'.	5
4A.	Derive the governing differential equilibrium equation for a rectangular plate subjected to uniform loading.	5
4B.	Obtain the equation of elastic surface of a simply supported rectangular plate subjected to a load 'q_o' over an area 'uv', having centroid location at (s,p).	5
5A.	Obtain the expressions for deflection of an annular plate simply supported at outer edges (r = a) and loaded by shear force 'P_1' at the inner edge (r = b).	5
5B.	Derive the expression for Gaussian curvature and classify the shells based on Gaussian curvature.	5