Reg. No.										

MANIPAL INSTITUTE OF TECHNOLOGY

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I SEMESTER M.TECH. (Structures.) END SEMESTER EXAMINATIONS

FEBRUARY 2021

SUBJECT: ADVANCED MECHANICS OF SOLIDS

[CIE 5171]

Date of Exam: 22-02-2021 Time of Exam: 2PM-5PM Max. Marks: **50**

Instructions to Candidates:

- ❖ Answer all the questions
- ❖ Any missing data may be suitably assumed

1A.	The state of a stress at a point in a body is given by, $\begin{bmatrix} -25 & -65 & -45 \\ -65 & 30 & 20 \\ -45 & 20 & 45 \end{bmatrix} MPa$ determine the principal stresses and corresponding planes, maximum shear stresses and corresponding planes.	**6**	**CO1**
1B.	The general displacement fields in a body in Cartesian coordinate system is given by, $u = 3y^2x + x^2$; $v = yz + 3xy$; $w = xz^2 + 4xy^2$. Find strain tensor and the linear strain at the point (-2, 2, 2) in the direction (0.56, -0.13, -0.819).	**4**	**CO2**
2A.	A simply supported beam of length 'l' and depth 'd' with unit thickness is subjected to a concentrated force at the mid span. Using Airy's stress function determine the stresses in the beam. Assume the coordinate origin at the left-hand support.	**6**	**CO2**
2B.	The data for a strain rosette is given as, $\epsilon_{0^\circ} = 600 \times 10^{-6}, \epsilon_{45^\circ} = -920 \times 10^{-6}, \epsilon_{90^\circ} = -300 \times 10^{-6}$. Find the principal planes and their directions.	**4**	**CO1**
3A.	Derive the equilibrium equation for a 2D - polar coordinate system corresponding to radial direction.	**5**	**CO3**
3B.	A simply supported rectangular plate of dimension a×b with thickness 't' subjected to a line load of intensity q_0. Using the Navier's solution technique obtain expression for the deflection of the plate.	**5**	**CO4**
4A.	Obtain the equilibrium equations corresponding to transverse direction (z-direction) and curved direction (θ-direction) for a curved plate subjected to a general transverse loading $q(r,\theta)$.	**5**	**CO4**
4B.	Explain the classification of shells.	**5**	**CO5**
5A.	What is a shell element? What are the assumptions made in thin shell theory?	**3**	**CO5**
5B.	With a neat sketch show the stress resultants in a thin shell and derive the expressions corresponding to normal forces and shear forces (both in-plane variation and variation across depth).	**7**	**CO5**