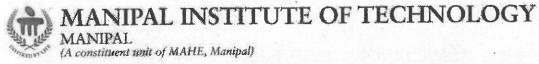
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## I SEMESTER M.TECH. (Structures.) END SEMESTER EXAMINATIONS

FEBRUARY 2021

## SUBJECT: ADVANCED MECHANICS OF SOLIDS [CIE 5171] Time of Exam: 2PM-5PM

Date of Exam: 22-02-2021

Max. Marks: 50

## Instructions to Candidates:

Answer all the questions

Any missing data may be suitably assumed

The state of a stress at a point in a body is given by,	-			
and corresponding planes.  The general displacement fields in a body in Cartesian coordinate system is given by, u = 3y²x + x²; v = yz + 3xy; w = xz² + 4xy². Find strain tensor and the linear strain at the point (-2, 2, 2) in the direction (0.56, -0.13, -0.819).  A simply supported beam of length '1' 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.  The data for a strain rosette is given as,  E <sub>0°</sub> = 600 × 10 <sup>-6</sup> , ∈ <sub>45°</sub> = −920 × 10 <sup>-6</sup> , ∈ <sub>90°</sub> = −300 × 10 <sup>-6</sup> . Find the principal planes and their directions.  Derive the equilibrium equation for a 2D - polar coordinate system corresponding to radial direction.  A simply supported rectangular plate of dimension a×b with thickness 't' subjected to a line load of intensity q₀. Using the Navier's solution technique obtain expression for the deflection of the plate.  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,θ).  4B. Explain the classification of shells.  5  What is a shell element? What are the assumptions made in thin shell theory?  With a neat sketch show the stress resultants in a thin shell and derive the expressions		-25 -65 -45 -65 30 20 MPa -45 20 45	6	CO1
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<ul> <li>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.</li> <li>The data for a strain rosette is given as,</li> <li>2B.</li></ul>	T. u	The general displacement fields in a body in Cartesian coordinate system is given by, $x = 3y^2x + x^2$ ; $y = yz + 3xy$ ; $y = xz^2 + 4xy^2$ . Find strain tensor and the linear strain at	4	CO2
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<ul> <li>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,θ).</li> <li>Explain the classification of shells.</li> <li>What is a shell element? What are the assumptions made in thin shell theory?</li> <li>With a neat sketch show the stress resultants in a thin shell and derive the expressions</li> </ul>	A simply supported rectangular plate of dimension a×b with thickness 't' subjected to a line load of intensity q <sub>0</sub> Using the Navier's solution technique obtain expression for		5	CO4
4B. Explain the classification of shells.  5A. What is a shell element? What are the assumptions made in thin shell theory?  With a neat sketch show the stress resultants in a thin shell and derive the expressions	Obtain the equilibrium equations corresponding to transverse direction (z-direction) and curved direction (θ-direction) for a curved plate subjected to a general transverse		5	CO4
What is a shell element? What are the assumptions made in thin shell meory?  With a neat sketch show the stress resultants in a thin shell and derive the expressions			5	CO5
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	A. What is a shell element? What are the assumptions made in thin shell theory?			CO5
variation across depth).	B. corresponding to normal forces and shear forces (both in-plane variation and		7	CO5