

M. C. E. EXAMINATION, 2025  
1<sup>st</sup> semester

THEORY OF ELASTICITY AND ELASTIC STABILITY  
Time 3 hours Full marks 100

Answer each part in separate answer scripts

Part- I (Full marks 60)

Answer all questions.

1. With neat diagrams deduce the following relationship where the variables hold their usual meaning:  $\sigma'_{ij} = a_{ip} a_{jq} \sigma_{pq}$   
Deduce the expressions for maximum shear stress and their orientation with respect to the principal stress directions. 10+10 = 20 [CO1]
2. Derive the Jacobian matrix for displacement and state the necessary and sufficient condition for any admissible displacement. From the displacement gradient vector, derive the expressions for strain and rotation. How do you interpret them in a two-dimensional plane? 10+2+8=20 [CO2]
3. Derive the stress-strain law of an isotropic material from the [D] matrix for an orthotropic material. 20 [CO3]

[ Turn over

**M.E. CIVIL ENGINEERING FIRST YEAR FIRST SEM. EXAM. -2025****Subject: THEORY OF ELASTICITY AND ELASTIC STABILITY****Time: 3 Hrs****Full Marks 100****PART-II (MARKS-40)**

Use a separate Answer-Script for each part

<b>No. of questions</b>	<b><u>Answer all questions</u></b>	<b>Marks 10+20+10=40</b>
1.	a) What do you mean by stable, unstable and neutral equilibrium. Discuss with neat sketch. b) Write short note on different types of structural instability	5+5 =10
2.	Determine the elastic buckling load of a column having one fixed support and other end free. Also determine the buckling load of a column having both end fixed support.	15+5=20
3.	Deduce the bending moment and curvature relationship of plate bending with neat sketch.	10