

**BIRLA INSTITUTE OF TECHNOLOGY, MESRA, RANCHI  
(END SEMESTER EXAMINATION)**

**CLASS: MTECH  
BRANCH: MECHANICAL**

**SEMESTER : II  
SESSION : SP/2025**

**SUBJECT: ME503 ADVANCED STRESS ANALYSIS**

**TIME: 3 Hours**

**FULL MARKS: 50**

**INSTRUCTIONS:**

1. The question paper contains 5 questions each of 10 marks and total 50 marks.
  2. Attempt all questions.
  3. The missing data, if any, may be assumed suitably.
  4. Before attempting the question paper, be sure that you have got the correct question paper.
  5. Tables/Data hand book/Graph paper etc. to be supplied to the candidates in the examination hall.
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		CO	BL
Q.1(a)	Derive Cauchy stress formula on stress component on an arbitrary plane.	[5] 1	L
Q.1(b)	Derive the three real roots of cubic equation of Cauchy stress formula and what are their proof.	[5] 1	M
Q.2(a)	Derive the deformation expression of strain in the neighborhood of a point.	[5] 2	L
Q.2(b)	Derive the state of strain at a point and interpret of shear strain component.	[5] 2	L
Q.3(a)	What are the important theories of failure in machine design and which theory of failure is suitable for ductile materials and brittle materials? Explain anyone.	[5] 3	L
Q.3(b)	Derive the expression for distortion energy theory.	[5] 3	M
Q.4(a)	What is the uniqueness theorem. Explain it	[5] 4	H
Q.4(b)	Explain maximum principle strain criteria.	[5] 4	L
Q.5(a)	Write the assumptions and governing equation of Saint-Venant's free torsion.	[5] 5	M
Q.5(b)	Describe the variation of bending stress expression within a plate	[5] 5	H

:26/04/2025:::E