

1. According to the maximum normal stress theory, failure occurs when:

- a) Shear stress exceeds the maximum allowable value
- b) Normal stress exceeds the maximum allowable value
- c) Both normal and shear stresses exceed their respective maximum allowable values
- d) Strain energy exceeds the maximum allowable value

Answer: b) Normal stress exceeds the maximum allowable value

Explanation: The maximum normal stress theory states that failure occurs when the maximum normal stress in a material exceeds the material's allowable normal stress.

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2. The maximum normal and shear strain energy theory predicts failure based on:

- a) Maximum normal strain only
- b) Maximum shear strain only
- c) Both maximum normal and shear strains
- d) Total deformation

Answer: c) Both maximum normal and shear strains

Explanation: This theory considers both the normal and shear strain energies accumulated in a material. Failure occurs when either the maximum normal or shear strain energy exceeds the material's allowable strain energy.

3. The maximum distortion energy theory is applicable to materials that exhibit:

- a) Ductile behavior
- b) Brittle behavior
- c) Elastic behavior
- d) Plastic behavior

Answer: a) Ductile behavior

Explanation: The maximum distortion energy theory is commonly used for ductile materials as it accounts for the combination of normal and shear stresses that lead to yielding in such materials.

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4. When applying the maximum normal stress theory, which loading condition is typically considered?

- a) Uniaxial tension
- b) Biaxial tension
- c) Pure shear
- d) Torsion

Answer: a) Uniaxial tension

Explanation: The maximum normal stress theory is often applied to situations where the primary stress is normal to the cross-section, such as in uniaxial tension.

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5. The maximum shear stress theory is particularly useful for analyzing failure in materials subjected to:

- a) Pure tension
- b) Pure compression
- c) Pure shear
- d) Torsion

Answer: c) Pure shear

Explanation: The maximum shear stress theory is most applicable to materials experiencing pure shear stress, where the applied stress is parallel and opposite to each other, causing shear deformation.

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6. According to the maximum distortion energy theory, failure occurs when:

- a) Total energy in the material exceeds a critical value
- b) Distortion energy exceeds a critical value
- c) Strain energy exceeds a critical value

d) Elastic modulus exceeds a critical value

Answer: b) Distortion energy exceeds a critical value

Explanation: This theory posits that failure occurs when the accumulated distortion energy in the material exceeds a certain critical value, irrespective of the nature of loading.

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7. Which theory of failure is commonly used for brittle materials under complex loading conditions?

- a) Maximum normal stress theory
- b) Maximum shear stress theory
- c) Maximum distortion energy theory
- d) None of the above

Answer: c) Maximum distortion energy theory

Explanation: Brittle materials often fail due to the accumulation of distortion energy, making the maximum distortion energy theory more appropriate for analyzing their failure under complex loading conditions.

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8. When analyzing materials with significant ductility, which theory of failure is more

accurate?

- a) Maximum normal stress theory
- b) Maximum shear stress theory
- c) Maximum distortion energy theory
- d) Maximum strain energy theory

Answer: c) Maximum distortion energy theory

Explanation: Ductile materials tend to deform significantly before failure, making the accumulation of distortion energy a critical factor, thus favoring the maximum distortion energy theory.

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9. Which loading condition would the maximum shear stress theory be most applicable to?

- a) Torsion
- b) Bending
- c) Compression
- d) Uniaxial tension

Answer: a) Torsion

Explanation: Torsion involves shear stresses acting on a material, making it the most suitable loading condition for applying the maximum shear stress theory.

10. The maximum normal and shear strain energy theory is also known as:

- a) Mohr's theory
- b) Guest's theory
- c) von Mises criterion
- d) Coulomb's theory

Answer: c) von Mises criterion

Explanation: The maximum normal and shear strain energy theory is commonly referred to as the von Mises criterion, which is widely used for ductile materials subjected to complex loading conditions.

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