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.

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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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