1. Which formula is commonly used to determine the critical load for a column with different end conditions?

a) Newton’s formula
b) Euler’s formula
c) Archimedes’ formula
d) Pythagoras’ formula

Answer: b) Euler’s formula

Explanation: Euler’s formula is extensively used in structural engineering to calculate the critical load that a column can withstand before buckling. It considers various factors such as material properties and end conditions to predict stability.

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2. What does Euler’s formula for columns with different end conditions primarily depend on?

a) Material density
b) Column diameter
c) Column length
d) Material tensile strength

Answer: c) Column length

Explanation: Euler’s formula for columns considers the column’s length as a critical factor in determining its stability. Longer columns tend to buckle more easily under load compared to

shorter ones.

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3. In Euler’s formula for columns, what does the term ‘effective length factor’ represent?

a) The column’s compressive strength
b) The ratio of column length to diameter
c) The ratio of actual length to ideal length
d) The column’s material modulus of elasticity

Answer: c) The ratio of actual length to ideal length

Explanation: The effective length factor in Euler’s formula denotes the ratio of the column’s actual length to its idealized length, considering its end conditions. It accounts for how the column is supported or restrained at its ends.

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4. Which end condition in Euler’s formula results in the lowest critical load for a column?

a) Pinned-pinned
b) Fixed-fixed
c) Fixed-pinned
d) Pinned-free

Answer: b) Fixed-fixed

Explanation: In Euler’s formula, a column with fixed-fixed end conditions typically has the lowest critical load capacity due to the high degree of restraint at both ends, making it more susceptible to buckling.

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5. What is the primary limitation of Euler’s formula in predicting column stability?

a) It only applies to certain materials
b) It neglects the effects of material properties
c) It assumes perfect geometrical conditions
d) It does not consider loading conditions

Answer: c) It assumes perfect geometrical conditions

Explanation: Euler’s formula assumes idealized conditions, such as perfectly straight columns and uniform cross-sections. In reality, imperfections in geometry can affect the accuracy of predictions.

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6. Rankine’s formula is primarily used to predict the critical load of:

a) Beams

b) Trusses
c) Columns
d) Plates

Answer: c) Columns

Explanation: Rankine’s formula is specifically designed for calculating the critical load of columns, taking into account both the material properties and the geometric characteristics of the column.

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7. What does Rankine’s formula for columns incorporate that Euler’s formula does not?

a) Material density
b) Geometric imperfections
c) Material yield strength
d) Loading conditions

Answer: b) Geometric imperfections

Explanation: Rankine’s formula considers the effects of geometric imperfections in columns, which makes it more accurate in predicting the critical load compared to Euler’s formula under real-world conditions.

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8. Which type of column end condition does Rankine’s formula assume?

a) Perfectly fixed
b) Perfectly pinned
c) Imperfectly fixed
d) Imperfectly pinned

Answer: b) Perfectly pinned

Explanation: Rankine’s formula typically assumes that the column is perfectly pinned at both ends, which simplifies the analysis while providing reasonable accuracy for many practical cases.

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9. In Rankine’s formula, what role does the material yield strength play in determining column stability?

a) It defines the critical load
b) It influences the column’s buckling mode
c) It has no effect on stability
d) It determines the column’s maximum length

Answer: a) It defines the critical load

Explanation: Material yield strength directly affects the critical load calculated by Rankine’s formula. Columns made from materials with higher yield strengths can withstand higher loads before buckling occurs.

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10. What distinguishes Rankine’s formula from Euler’s formula in terms of application?

a) Rankine’s formula is more accurate for short columns
b) Rankine’s formula is applicable only to steel columns
c) Euler’s formula is based on empirical data
d) Euler’s formula considers material plasticity

Answer: a) Rankine’s formula is more accurate for short columns

Explanation: While Euler’s formula is more suitable for long and slender columns, Rankine’s formula provides better accuracy for short columns due to its consideration of geometric imperfections.

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