Modern Methods for Learning the Basics of Structural Stability: From Behavior to Practice
Session 1: Behavior of Compression Members – The Fundamentals – October 6, 2020
Due: November 3, 2020, 8:00 am EST – Submit through the online form

1. Per the course definitions, which of the following is correct?
    a. Bifurcation (critical load) and instability are both theoretical points at which there is an instantaneous change from the current state to significant deflection.
    b. Bifurcation (critical load) and instability are the points where yielding becomes significant.
    c. Instability is the theoretical point at which there is an instantaneous change from the current state to significant deflection, whereas bifurcation (critical load) is a realistic transition from small deflection to significant deflection.
    d. Bifurcation (critical load) is the theoretical point at which there is an instantaneous change from the current state to significant deflection, whereas instability is an actual transition from small deflection to significant deflection.
    e. None of the above.

2. Limit states for compression members include:
    a. Flexural buckling.
    b. Torsional buckling.
    c. Flexural-torsional buckling.
    d. Local buckling.
    e. All of the above.

3. Two key components in developing the governing differential equation related to column buckling problems are:
    a. Equilibrium and shear strains must be constant.
    b. Base material being anisotropic and ductile.
    c. Equilibrium and moment curvature relationships.
    d. Support conditions must be frictionless pins and base material ductile.
    e. None of the above.

4. In solving the differential equation for Euler buckling, several buckling loads and modes can be computed. Which of the following is true in regard to these higher buckling loads and modes?
    a. They are of no interest to the designer.
    b. They could be used to determine appropriate locations for bracing.
    c. The higher buckling loads are too small to be of significance.
    d. The higher buckling loads are related to local buckling.
    e. None of the above.

5. When considering the bending due to an axial load acting on a column that is not perfectly straight, the out-of-straightness is assumed to be in the shape of:
    a. A parabola.
    b. A sine curve.
    c. A semicircle.
    d. None of the above.

6. A stub column section containing residual stresses undergoes compression. Which of the following is true regarding the axial stress-strain relationship of the column? *E* is the modulus of elasticity and *A* is the cross-sectional area of the column.
    a. There is a linear relationship between stress and strain at applied stress levels up to the yield stress.
    b. When the applied stress reaches 70% of the yield stress, the effective stiffness of the column is approximately 70% of *EA*.
    c. The stress-strain relationship is non-linear for the entire stress range.
    d. If the applied stress is less than the yield stress minus the residual stress, the stiffness of the column will not be reduced.
    e. The axial stress is typically twice the value of the axial strain.

7. True or False: The AISC *Specification*'s column curve provides an exact prediction for all I-shaped sections appearing in the AISC *Manual*.
    a. True
    b. False

8. In regard to steel compression members, which of the following is true?
    a. Residual stresses are too small to be of any concern.
    b. Sections without residual stresses always experience elastic buckling.
    c. Residual stresses have a greater impact on minor-axis buckling strength than on major-axis buckling strength.
    d. Rotary straightening has no impact on residual stresses.
    e. All of the above are true.

9. True or False: The single strength curve of the AISC *Specification* does not reflect potential differences in major and minor axis flexural buckling strength of I-shaped members.
    a. True
    b. False

10. In Learning Module 1, demonstrated in this lecture, which of the following was determined to be correct?
    a. The critical buckling load of the fixed-free column was half that of the pinned-roller column.
    b. The critical buckling load of the fixed-free column was equal to that of the pinned-roller column.
    c. The critical buckling load of the fixed-fixed column was twice that of the pinned-roller column.
    d. The critical buckling load of the fixed-fixed column was 16 times that of the fixed-free column.