Modern Methods for Learning Basics of Structural Stability: From Behavior to Practice
Session 7: Behavior of Structural Systems – The Fundamentals – December 1, 2020
Due: December 29, 2020, 8:00 a.m. EST – Submit through online form

1. Which of the following factors influence the stability of a system and its components?
    a. Flexural, shear, axial deformations, etc.
    b. Equilibrium on the deformed shape
    c. Initial geometric imperfections
    d. Loss in stiffness due to partial yielding accentuated by the presence of residual stresses
    e. All of the above

2. True or False: In an elastic analysis, strength of a system is assured by force redistribution due to yielding.
    a. True
    b. False

3. True or False: If one wishes to avoid consideration of second order effects, one should use the effective length method rather than the direct analysis method.
    a. True
    b. False

4. Which of the following is true?
    a. The B_1 factor accounts for story sway P-Δ effects.
    b. The B_2 factor can be expressed in terms of story stiffness.
    c. The B_2 factor should be modified by C_m to account for cases of moment gradient.
    d. All of the above

5. Which of the following parameters does the speaker mention as an indicator of stability sensitivity for structural systems?
    a. Amplification factors, B_1 and B_2
    b. Critical buckling load factor, λ_{cr}
    c. Natural periods together with mode shapes
    d. All of the above

6. Which of the following analysis methods does the speaker identify as most closely adhering to bifurcation theory?
    a. Effective length method
    b. Direct analysis method
    c. Advanced elastic analysis
    d. Inelastic analysis

7. In the direct analysis method, what does the equivalent notional load, $N_i = 0.002Y_i$ represent?
    a. Wind drift limits
    b. Seismic drift limits
    c. Maximum column plumbness tolerances per the AISC *Code of Standard* Practice.
    d. Member out-of-straightness.

8. Which of the following is a difference between the direct analysis method (DM) and the effective length method (ELM)?
    a. DM requires you to consider shear deformations, while ELM does not.
    b. DM uses a reduced stiffness in the analysis while ELM uses full stiffness.
    c. DM requires direct modeling of imperfections while ELM requires applying notional loads.
    d. $L_c = L$ for DM member strength check, while $L_c = KL$ for ELM where K is determined from a buckling analysis or other rational method, such as alignment charts.
    e. All of the above
    f. (a) and (b) only
    g. (b) and (d) only

9. If one were to design a structure using advanced elastic analysis following Appendix 1 of AISC *Specification*, what unbraced length is used for a member with laterally unbraced length, L?
    a. KL, where the effective length factor, K, is determined by Appendix 7
    b. L, (i.e., assume that $K = 1$)
    c. Either of the above approaches (answer a or b) is used
    d. None of the above

10. What two parameters in the axial-flexure interaction equation does the speaker highlight as being significantly impacted by the choice of analysis method?
    a. Available axial strength, P_n, and available flexural strength, M_n
    b. Available axial strength, P_n, and required flexural strength, M_u
    c. Required axial strength, P_u, and available flexural strength, M_n
    d. Required axial strength, P_u, and required flexural strength, M_u