Fundamentals of Earthquake Engineering for Building Structures
Final Exam
Due: May 17, 2021, 8:00 am EDT – Submit through the online form

Pick the best answer

1) Earthquake intensity decreases with
   a) Increasing distance from the epicenter
   b) Increasing soil stiffness
   c) Increasing return period
   d) Both A and B

2) Earthquake intensity may describe
   a) The total energy released
   b) The acceleration at a given site
   c) The return period of the ground motion
   d) The duration of the ground motion

3) Probabilistic ground motions are
   a) Accelerations corresponding to a defined return period considering multiple sources (faults)
   b) Accelerations corresponding to an earthquake of a known magnitude at a known fault

4) The natural period of vibration of a critically damped structure is
   a) Half of the undamped natural period
   b) Twice the undamped natural period
   c) None of the above

5) Structures may be designed for forces significantly lower than the elastic spectral acceleration because
   a) As the structure yields, its period is effectively longer and its response may reflect a longer-period spectral acceleration
   b) As the structure yields, it dissipates energy and its response may reflect a more highly damped spectral acceleration
   c) All of the above

6) Post-yield structural stiffness
   a) Helps maintain structural stability
   b) Helps limit inelastic displacement
   c) Results in higher accelerations
   d) All of the above

7) Modal response quantities can be obtained
   a) If they are tracked mode by mode rather than obtained indirectly from other response quantities
   b) If modal maxima are appropriately combined using the Square-root-of-the-sum-of-the-squares (SRSS) [or the Complete Quadratic Combination (CQC) for closely spaced modes]
   c) If the modes analyzed comprise a sufficient proportion of the building mass
   d) All of the above

8) The fundamental mode
   a) Tends to have the highest overturning
   b) Tends to have the highest mass participation
   c) Has the longest period
   d) All of the above

9) The vertical force distribution used in the Equivalent Lateral Force method
   a) Underestimates overturning but reflects story shear reasonably
   b) Underestimates story shear but reflects overturning reasonably
   c) Reflects story shear and overturning reasonably but underestimates story forces, especially at lower levels

10) Steel weld backing is more problematic at the bottom flange than at the top flange because
   a) Backing is at the extreme fiber at the bottom flange.
   b) The weld procedure requires starting and stopping the pass within the joint due to the obstruction of the web
   c) The deck above the top flange can limit some of the strain demand there
   d) Local bending in the flange increases strain at the extreme fiber
   e) All of the above.

11) A ductile steel material in a highly restrained condition
   a) May not exhibit much elongation.
   b) May not exhibit much notch toughness

12) The mean yield stress of a material is called the
   a) The specified minimum yield stress
   b) The expected yield stress
   c) The probable yield stress

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13) Which of the following is not beneficial for ductility in seismic design?
    a) Utilizing a ductile material
    b) Utilizing highly compact shapes
    c) Using extremely strong fuse members
    d) Utilizing connections stronger than the fuse members
    e) Spreading ductility demands to multiple elements
    f) All of the above
    g) Both A and C
    h) None of the above

14) Using highly compact shapes
    a) Prevents or forestalls local buckling
    b) Increases notch toughness
    c) Increases rotation capacity
    d) Increases material ductility
    e) All of the above
    f) Both A and C
    g) None of the above

15) "Capacity design" means
    a) Deriving the required strength of a member or connection from the capacity of an adjacent member
    b) Deriving the required strength of all members and connections from load effects determined in the global analysis model
    c) system yield mechanism in which multiple members are yielding
    d) All of the above
    e) Both A and C
    f) None of the above

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16) In a moment frame which of the following are used in determining the panel-zone shear?
    a) Beam probable moment capacity
    b) Column probable moment capacity
    c) The shear capacity of the beam
    d) The shear capacity of the column
    e) Beam seismic shear corresponding to the ASCE-7 base-shear forces
    f) Column seismic shear corresponding to the ASCE-7 base-shear forces
    g) Beam seismic shear corresponding to beam probable moment capacity
    h) Column seismic shear corresponding to beam probable moment capacity
    i) None of the above
    j) All of the above
    k) B and C
    l) A, G, and H
    m) A and H

17) In the Reduced Beam Section moment frame connection, shifting the plastic hinge location away from the face of the column
    a) Provides higher stiffness
    b) Imposes inelastic strain demand in a highly restrained location, increasing strength
    c) Protects the connection at the face of the column by limiting stresses and strains there
    d) None of the above

18) In braced frames, two plastic mechanism analyses are required because
    a) Brace behavior changes significantly after buckling such that a single analysis is insufficient
    b) One analysis captures maximum overturning and maximum forces on end columns and the other analysis captures redistribution forces and maximum forces on interior columns and on beams.
    c) Both A and B
    d) None of the above

19) The seismic load path connects
    a) Diaphragms to the braced frames or moment frames
    b) Building inertial masses to the foundations and soil
    c) Los Angeles and Anchorage
    d) Both A and B

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20) In analyzing a building with flexible diaphragms
    a) Diaphragms must be analyzed using a 3-dimensional model
    b) Diaphragms may be analyzed as a beam spanning over flexible supports
    c) Diaphragms may be analyzed as a beam spanning over rigid supports

21) "Deformation compatibility" requires
    a) The gravity-resisting connections to remain elastic at the drift levels anticipated for the seismic system
    b) The gravity-resisting columns to remain elastic at the drift levels anticipated for the seismic system
    c) Fully rigid connections at all beam-to column connections
    d) The gravity-resisting system to maintain its integrity at the drift levels anticipated for the seismic system

22) ASCE 7 contains
    a) Loads
    b) System height limits
    c) Seismic Design Category restrictions
    d) Definitions of irregularity
    e) Drift limits
    f) Load combinations
    g) All of the above
    h) None of the above

23) The vertical and horizontal irregularities identified in ASCE 7
    a) Address potential building dynamic characteristics that may not be adequately addressed using the equivalent lateral force method
    b) Address certain load-path issues that may be overlooked
    c) All of the above
    d) None of the above

24) If wind base shear is greater than seismic base shear
    a) Seismic story shear may be greater than wind story shear at upper levels due to the different force patterns
    b) Seismic overturning may be greater than wind overturning due to the different force patterns
    c) Seismic forces may be greater than wind forces for elements required to resist amplified seismic forces
    d) Capacity-design requirements for special seismic systems may require larger sizes and stronger connections than are required for wind forces
    e) Drift limits may require larger sizes than are required for wind forces
    f) Seismic load may be greater for heavy components and those not exposed to wind
    g) All of the above