GEOTECHNICAL CIVIL PE EXAM PREP

100-QUESTION PRACTICE EXAM 18

Standalone PDF - U.S. customary units unless noted
Answer key and worked solutions included

UNOFFICIAL PRACTICE MATERIAL
This independently written practice exam is not produced, endorsed, or reviewed by NCEES. Verify current references, standards, and examination policies with NCEES.

Candidate Instructions

- Complete all 100 questions before consulting the answer key or solutions.
- Suggested pacing: 10 hours total, or two timed 50-question sessions.
- Select the single best answer. The official CBT examination may also use alternative item types.
- Use the official NCEES PE Civil Reference Handbook and design standards applicable to your exam date.
- Round to the nearest listed answer and record errors by concept, formula, units, reference navigation, or pacing.

Blueprint

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Site Characterization

1. A geotechnical consultant is performing a design check. a 5-ft rock core run yields 42 ft of core. determine the core recovery?

A. 850%
B. 828%
C. 840%
D. 860%

Answer: A B C D

2. For a project risk review, a 6-ft rock core run yields 48 ft of core. determine the core recovery?

A. 788%
B. 800%
C. 810%
D. 820%

Answer: A B C D

3. During field and design coordination, a 5-ft rock core run yields 36 ft of core. determine the core recovery?

A. 720%
B. 708%
C. 730%
D. 740%

Answer: A B C D

4. A peer reviewer evaluates the following condition. a 5-ft rock core run yields 44 ft of core. determine the core recovery?

A. 900%
B. 880%
C. 868%
D. 890%

Answer: A B C D

5. For final engineering recommendations, a 24-in core run contains 18 in of sound core pieces at least twice the core diameter. determine the RQD?

A. 85%
B. 55%
C. 75%
D. 65%

Answer: A B C D

6. A geotechnical consultant is performing a design check. a 30-in core run contains 20 in of sound core pieces at least twice the core diameter. determine the RQD?

A. 67%
B. 47%
C. 57%
D. 77%

Answer: A B C D

7. For a project risk review, a 25-in core run contains 15 in of sound core pieces at least twice the core diameter. determine the RQD?

A. 60%
B. 50%
C. 70%
D. 40%

Answer: A B C D

8. During field and design coordination, a 28-in core run contains 22 in of sound core pieces at least twice the core diameter. determine the RQD?

A. 69%
B. 89%
C. 59%
D. 79%

Answer: A B C D

9. A peer reviewer evaluates the following condition. which field method most directly provides a near-continuous profile of tip resistance and sleeve friction?

A. Plate load test
B. Field vane test
C. Cone penetration test
D. Standard penetration test

Answer: A B C D

10. For final engineering recommendations, which sampler is generally preferred for obtaining a relatively undisturbed sample of soft cohesive soil?

A. Thin-walled Shelby tube
B. Rock core barrel
C. Split-spoon sampler
D. Grab sampler

Answer: A B C D

11. A geotechnical consultant is performing a design check. a soil has 58% passing No. 200, LL = 42, and PI = 18. Under USCS, its broad classification is most likely:

A. Clean sand
B. Well-graded gravel
C. Silty or clayey fine-grained soil
D. Organic peat

Answer: A B C D

12. For a project risk review, for locating the groundwater surface in a borehole after pore pressures equilibrate, the most appropriate device is a:

A. Settlement plate
B. Inclinometer
C. Standpipe piezometer
D. Pressuremeter

Answer: A B C D

Soil Mechanics, Laboratory Testing, and Analysis

13. During field and design coordination, a soil has water content 18%, Gs = 2.70, and void ratio e = 0.65. determine its degree of saturation?

A. 85%
B. 75%
C. 60%
D. 95%

Answer: A B C D

14. A peer reviewer evaluates the following condition. a soil has water content 22%, Gs = 2.65, and void ratio e = 0.75. determine its degree of saturation?

A. 88%
B. 63%
C. 98%
D. 78%

Answer: A B C D

15. For final engineering recommendations, a soil has water content 15%, Gs = 2.68, and void ratio e = 0.55. determine its degree of saturation?

A. 73%
B. 93%
C. 58%
D. 83%
Answer: A B C D

16. A geotechnical consultant is performing a design check. a soil has water content 25%, Gs = 2.72, and void ratio e = 0.82. determine its degree of saturation?

A. 100%
B. 68%
C. 93%
D. 83%
Answer: A B C D

17. For a project risk review, at 15 ft depth, total vertical stress is based on an average unit weight of 120 pcf and pore pressure is 500 psf. determine vertical effective stress?

A. 1,800 psf
B. 1,300 psf
C. 800 psf
D. 2,300 psf
Answer: A B C D

18. During field and design coordination, at 20 ft depth, total vertical stress is based on an average unit weight of 118 pcf and pore pressure is 800 psf. determine vertical effective stress?

A. 1,560 psf
B. 3,160 psf
C. 2,360 psf
D. 760 psf
Answer: A B C D

19. A peer reviewer evaluates the following condition. at 12 ft depth, total vertical stress is based on an average unit weight of 125 pcf and pore pressure is 420 psf. determine vertical effective stress?

A. 1,920 psf
B. 1,500 psf
C. 1,080 psf
D. 660 psf
Answer: A B C D

20. For final engineering recommendations, at 18 ft depth, total vertical stress is based on an average unit weight of 115 pcf and pore pressure is 650 psf. determine vertical effective stress?

A. 2,720 psf
B. 1,420 psf
C. 2,070 psf
D. 770 psf
Answer: A B C D

21. A geotechnical consultant is performing a design check. a normally consolidated clay layer is 12 ft thick, e0=0.8, Cc=0.28. Effective stress doubles by a factor of 2.0. Estimate primary consolidation settlement.

A. 10.1 in
B. 6.7 in
C. 3.4 in
D. 13.5 in
Answer: A B C D

22. For a project risk review, a normally consolidated clay layer is 10 ft thick, e0=0.7, Cc=0.22. Effective stress doubles by a factor of 1.8. Estimate primary consolidation settlement.

A. 7.9 in
B. 2.0 in
C. 5.9 in
D. 4.0 in
Answer: A B C D

23. During field and design coordination, a normally consolidated clay layer is 15 ft thick, e0=0.9, Cc=0.30. Effective stress doubles by a factor of 1.5. Estimate primary consolidation settlement.

A. 2.5 in
B. 5.0 in
C. 7.5 in
D. 10.0 in

Answer: A B C D

24. A peer reviewer evaluates the following condition. a normally consolidated clay layer is 8 ft thick, e0=0.6, Cc=0.18. Effective stress doubles by a factor of 2.5. Estimate primary consolidation settlement.

A. 4.3 in
B. 2.1 in
C. 8.6 in
D. 6.4 in

Answer: A B C D

Construction Observation, Monitoring, QA/QC, and Safety

25. For final engineering recommendations, a nuclear gauge reports wet density 126 pcf at 8% water content. Dry density is closest to:

A. 108 pcf
B. 136 pcf
C. 117 pcf
D. 126 pcf

Answer: A B C D

26. A geotechnical consultant is performing a design check. the laboratory maximum dry density is 121 pcf and field dry density is 116 pcf. Relative compaction is:

A. 91.0%
B. 95.9%
C. 100.0%
D. 104.3%

Answer: A B C D

27. For a project risk review, which instrument is best suited to monitor lateral movement within an excavation support system?

A. Vibrating-wire load cell only
B. Inclinometer
C. Settlement plate
D. Piezometer

Answer: A B C D

28. During field and design coordination, a piezometer reading rises rapidly during embankment placement. The most appropriate immediate interpretation is:

A. Soil strength has necessarily increased
B. The fill is undercompacted
C. Settlement is complete
D. Excess pore pressure is developing

Answer: A B C D

29. A peer reviewer evaluates the following condition. for cohesive fill, the most representative routine acceptance test pairing is:

A. RQD and core recovery
B. Los Angeles abrasion and slump
C. CPT and pressuremeter
D. Field density/moisture and a laboratory moisture-density curve

Answer: A B C D

30. For final engineering recommendations, a 6-ft-deep trench in Type C soil has no protective system. Under OSHA excavation rules, the condition is generally:

A. Acceptable with a ladder only
B. Acceptable if open less than one day
C. Acceptable if soil is dry
D. Not acceptable; cave-in protection is required unless in stable rock

Answer: A B C D

31. A geotechnical consultant is performing a design check. when proofrolling reveals rutting and pumping, the preferred first response is to:

A. Place thicker pavement immediately
B. Increase asphalt temperature
C. Identify and remediate the unstable subgrade area
D. Ignore it if density tests passed

Answer: A B C D

32. For a project risk review, a settlement plate installed beneath an embankment primarily measures:

A. Soil suction
B. Horizontal strain
C. Vertical movement at its elevation
D. Pore pressure

Answer: A B C D

Earthquake Engineering and Dynamic Loads

33. During field and design coordination, liquefaction susceptibility is generally greatest in:

A. Loose saturated clean sand
B. Intact granite
C. Stiff overconsolidated clay
D. Dense dry gravel

Answer: A B C D

34. A peer reviewer evaluates the following condition. for a pseudo-static slope analysis, seismic loading is commonly represented by:

A. A permanent increase in cohesion
B. A horizontal inertial force khW
C. Removal of groundwater
D. A vertical surcharge only

Answer: A B C D

35. For final engineering recommendations, if kh = 0.15 and a potential sliding mass weighs 2,000 kips, the horizontal pseudo-static force is:

A. 300 kips
B. 150 kips
C. 2,000 kips
D. 30 kips

Answer: A B C D

36. A geotechnical consultant is performing a design check. which field parameter is routinely corrected for overburden and hammer energy before use in SPT-based liquefaction screening?

A. RQD
B. Atterberg limit
C. Hydraulic conductivity
D. N value

Answer: A B C D

37. For a project risk review, a saturated sand deposit densifies during shaking but drainage is too slow. The immediate consequence is generally:

A. Cementation
B. Negative pore pressure
C. Increased effective stress
D. Excess positive pore pressure and reduced effective stress

Answer: A B C D

38. During field and design coordination, site amplification of earthquake motions is commonly greater for:

A. Hard rock
B. Massive concrete
C. Shallow bedrock only
D. Soft soil deposits

Answer: A B C D

39. A peer reviewer evaluates the following condition. the cyclic resistance ratio represents:

A. Soil resistance to liquefaction triggering
B. Demand imposed by the earthquake
C. Static bearing capacity
D. Post-liquefaction settlement only

Answer: A B C D

Earth Structures, Ground Improvement, and Pavement

40. For final engineering recommendations, for a trial planar slide, normal force is 180 kips, driving shear is 90 kips, φ′=30°, c′=0 ksf, and plane length is 120 ft. determine the factor of safety?

A. 1.15
B. 1.44
C. 0.81
D. 1.73

Answer: A B C D

41. A geotechnical consultant is performing a design check. for a trial planar slide, normal force is 190 kips, driving shear is 90 kips, φ′=32°, c′=0 ksf, and plane length is 140 ft. determine the factor of safety?

A. 1.65
B. 1.32
C. 0.92
D. 1.98

Answer: A B C D

42. For a project risk review, for a trial planar slide, normal force is 170 kips, driving shear is 90 kips, φ′=28°, c′=5 ksf, and plane length is 100 ft. determine the factor of safety?

A. 9.84
B. 4.59
C. 8.20
D. 6.56

Answer: A B C D

43. During field and design coordination, for a trial planar slide, normal force is 210 kips, driving shear is 90 kips, φ′=35°, c′=0 ksf, and plane length is 160 ft. determine the factor of safety?

A. 1.63
B. 1.14
C. 2.04
D. 2.45

Answer: A B C D

44. A peer reviewer evaluates the following condition. which ground-improvement method is most directly used to accelerate consolidation of a thick soft clay layer beneath a surcharge?

A. Prefabricated vertical drains
B. Rock bolts
C. Dynamic compaction only
D. Vibrocompaction alone

Answer: A B C D

45. For final engineering recommendations, lime treatment is generally most effective for:

A. Intact rock
B. Plastic clay
C. Clean gravel
D. Organic peat with very high organic content

Answer: A B C D

46. A geotechnical consultant is performing a design check. a geotextile placed between aggregate base and weak subgrade primarily to prevent intermixing serves as:

A. Separation
B. Reinforcement only
C. Cathodic protection
D. A vapor barrier

Answer: A B C D

47. For a project risk review, for a geotextile filter, the opening size should primarily balance:

A. UV resistance and density
B. Tensile strength and color
C. Soil retention and adequate permeability
D. Creep and thermal expansion only

Answer: A B C D

48. During field and design coordination, a reinforced-soil slope obtains improved stability mainly from:

A. Elimination of pore pressure
B. Increased rainfall infiltration
C. Tensile resistance mobilized in reinforcement
D. Reduced soil unit weight to zero

Answer: A B C D

49. A peer reviewer evaluates the following condition. preloading a compressible foundation before final construction is intended to:

A. Increase future primary settlement
B. Reduce effective stress
C. Raise groundwater permanently
D. Induce settlement before service

Answer: A B C D

50. For final engineering recommendations, for flexible pavement, a weaker subgrade generally requires:

A. Lower compaction
B. Greater structural thickness
C. No base course
D. Less structural thickness

Answer: A B C D

51. A geotechnical consultant is performing a design check. the most effective first-line control for seepage-related instability in an earth embankment is often:

A. Increase infiltration
B. Remove downstream toe support
C. Use open joints
D. Provide properly designed filters and drains

Answer: A B C D

52. For a project risk review, at a landfill liner interface, stability should be checked using:

A. Concrete compressive strength
B. SPT refusal
C. The weakest relevant interface shear strength
D. Only the soil's internal friction angle

Answer: A B C D

53. During field and design coordination, aggregate piers improve soft ground primarily by:

A. Eliminating all settlement
B. Creating voids
C. Dissolving clay minerals
D. Providing stiffer inclusions and drainage

Answer: A B C D

Groundwater and Seepage

54. A peer reviewer evaluates the following condition. using Darcy's law, k=0.002 ft/s, hydraulic gradient i=0.5, and flow area A=100 ft². determine discharge?

A. 0.100 ft³/s
B. 0.050 ft³/s
C. 1.000 ft³/s
D. 0.200 ft³/s

Answer: A B C D

55. For final engineering recommendations, using Darcy's law, k=0.001 ft/s, hydraulic gradient i=0.8, and flow area A=150 ft². determine discharge?

A. 0.060 ft³/s
B. 1.200 ft³/s
C. 0.240 ft³/s
D. 0.120 ft³/s

Answer: A B C D

56. A geotechnical consultant is performing a design check. using Darcy's law, k=0.003 ft/s, hydraulic gradient i=0.4, and flow area A=80 ft². determine discharge?

A. 0.048 ft³/s
B. 0.960 ft³/s
C. 0.096 ft³/s
D. 0.192 ft³/s

Answer: A B C D

57. For a project risk review, boiling or piping at the base of an excavation occurs when:

A. Upward seepage force approaches the submerged soil weight
B. Soil is dry
C. Total stress increases
D. Downward gradient is zero

Answer: A B C D

58. During field and design coordination, for lowering groundwater in a permeable sand excavation, a common system is:

A. Soil nails only
B. Settlement plates
C. Wellpoints
D. Compaction grouting only

Answer: A B C D

59. A peer reviewer evaluates the following condition. a cutoff wall beneath an earth dam primarily reduces seepage by:

A. Removing the downstream filter
B. Shortening the flow path
C. Increasing hydraulic head
D. Lengthening the flow path and intercepting permeable strata

Answer: A B C D

Problematic Soil and Rock Conditions

60. For final engineering recommendations, an expansive clay poses the greatest heave risk when:

A. Its moisture content increases after construction
B. Its moisture content remains constant
C. It is replaced by clean aggregate
D. It is isolated from water

Answer: A B C D

61. A geotechnical consultant is performing a design check. collapsible soil typically experiences sudden settlement when it is:

A. Dried under no load
B. Wetted while stressed
C. Densified before loading
D. Frozen

Answer: A B C D

62. For a project risk review, frost heave requires frost-susceptible soil, freezing temperatures, and:

A. Intact rock
B. A water supply
C. High salinity only
D. Dry conditions

Answer: A B C D

63. During field and design coordination, in karst terrain, the investigation should emphasize:

A. Only surface soil color
B. Uniform bedrock elevation
C. Pavement markings
D. Potential solution cavities and variable rockhead

Answer: A B C D

64. A peer reviewer evaluates the following condition. for a potentially corrosive soil around buried metal, which test is most directly relevant?

A. Soil resistivity
B. Liquid limit only
C. RQD
D. Slump

Answer: A B C D

65. For final engineering recommendations, a practical rockfall mitigation measure for a steep jointed rock cut is:

A. Scaling and anchored mesh/catchment
B. Undercut the toe indiscriminately
C. Add surcharge at crest
D. Remove all drainage

Answer: A B C D

Retaining Structures

66. A geotechnical consultant is performing a design check. a level-backfill wall is 12 ft high. Soil has $\varphi' = 30°$, $\gamma = 120$ pcf, $c' = 0$, and no surcharge. Using Rankine active pressure, what is the resultant lateral force per foot of wall?

A. 2.3 kip/ft
B. 1.4 kip/ft
C. 4.6 kip/ft
D. 3.5 kip/ft

Answer: A B C D

67. For a project risk review, a level-backfill wall is 15 ft high. Soil has φ′=32°, γ=118 pcf, c′=0, and no surcharge. Using Rankine active pressure, what is the resultant lateral force per foot of wall?

A. 1.8 kip/ft
B. 4.6 kip/ft
C. 3.1 kip/ft
D. 6.1 kip/ft

Answer: A B C D

68. During field and design coordination, a level-backfill wall is 10 ft high. Soil has φ′=28°, γ=125 pcf, c′=0, and no surcharge. Using Rankine active pressure, what is the resultant lateral force per foot of wall?

A. 3.8 kip/ft
B. 1.9 kip/ft
C. 2.9 kip/ft
D. 1.1 kip/ft

Answer: A B C D

69. A peer reviewer evaluates the following condition. a level-backfill wall is 14 ft high. Soil has φ′=35°, γ=115 pcf, c′=0, and no surcharge. Using Rankine active pressure, what is the resultant lateral force per foot of wall?

A. 1.2 kip/ft
B. 4.0 kip/ft
C. 3.0 kip/ft
D. 2.0 kip/ft

Answer: A B C D

70. For final engineering recommendations, a level-backfill wall is 18 ft high. Soil has φ′=30°, γ=122 pcf, c′=0, and no surcharge. Using Rankine active pressure, what is the resultant lateral force per foot of wall?

A. 7.9 kip/ft
B. 5.3 kip/ft
C. 3.2 kip/ft
D. 10.6 kip/ft

Answer: A B C D

71. A geotechnical consultant is performing a design check. the resultant of a triangular active earth-pressure distribution acts at:

A. H/2 above base
B. 2H/3 above base
C. H/3 above base
D. At the top

Answer: A B C D

72. For a project risk review, for a uniform surcharge q behind a wall, the added active pressure is:

A. Zero
B. Equal to γH
C. Uniform with magnitude Kaq
D. Triangular, maximum at base

Answer: A B C D

73. During field and design coordination, passive earth resistance in front of a wall should often be used cautiously because:

A. It is independent of soil strength
B. Large movement may be required to mobilize it and soil may be removed
C. It is always zero
D. It acts upward only

Answer: A B C D

74. A peer reviewer evaluates the following condition. a drainage layer behind a retaining wall is intended primarily to:

A. Reduce wall weight
B. Prevent buildup of hydrostatic pressure
C. Increase surcharge
D. Increase hydrostatic pressure

Answer: A B C D

75. For final engineering recommendations, the external stability checks for a gravity retaining wall include:

A. Only corrosion
B. Only tensile rupture
C. Sliding, overturning, and bearing
D. Only nail pullout

Answer: A B C D

76. A geotechnical consultant is performing a design check. an anchored excavation support wall gains lateral restraint from:

A. Reducing wall stiffness to zero
B. Tiebacks transferring load beyond the active zone
C. Surface paint
D. Settlement plates

Answer: A B C D

77. For a project risk review, for a braced cut, struts primarily carry:

A. Hydrostatic uplift only
B. Compression
C. Torsion only
D. Tension only

Answer: A B C D

78. During field and design coordination, underpinning is used primarily to:

A. Measure pore pressure
B. Remove all adjacent structures
C. Support or transfer loads from an existing foundation
D. Increase excavation inflow

Answer: A B C D

79. A peer reviewer evaluates the following condition. a soil nail wall is generally constructed:

A. Underwater without facing
B. Top-down in staged excavations
C. Bottom-up with driven piles only
D. By preloading the entire wall

Answer: A B C D

Shallow Foundations

80. For final engineering recommendations, for a strip footing, use $q_{ult}=cN_c+qN_q+0.5\gamma BN_\gamma$. Given $c=0$ ksf, $N_c=30$, $q=1000$ psf, $N_q=18$, $\gamma=120$ pcf, $B=6$ ft, $N_\gamma=15$, and $FS=3$, estimate allowable gross bearing pressure.

A. 11.7 ksf
B. 3.9 ksf
C. 7.8 ksf
D. 23.4 ksf

Answer: A B C D

81. A geotechnical consultant is performing a design check. for a strip footing, use qult=cNc+qNq+0.5γBNγ. Given c=1 ksf, Nc=25, q=800 psf, Nq=16, γ=118 pcf, B=5 ft, Nγ=12, and FS=3, estimate allowable gross bearing pressure.

A. 16.4 ksf
B. 8.2 ksf
C. 2.7 ksf
D. 5.5 ksf

Answer: A B C D

82. For a project risk review, for a strip footing, use qult=cNc+qNq+0.5γBNγ. Given c=0 ksf, Nc=28, q=900 psf, Nq=17, γ=125 pcf, B=8 ft, Nγ=14, and FS=3, estimate allowable gross bearing pressure.

A. 3.7 ksf
B. 11.2 ksf
C. 7.4 ksf
D. 22.3 ksf

Answer: A B C D

83. During field and design coordination, for a strip footing, use qult=cNc+qNq+0.5γBNγ. Given c=0 ksf, Nc=32, q=1100 psf, Nq=20, γ=115 pcf, B=7 ft, Nγ=18, and FS=3, estimate allowable gross bearing pressure.

A. 14.6 ksf
B. 29.2 ksf
C. 9.7 ksf
D. 4.9 ksf

Answer: A B C D

84. A peer reviewer evaluates the following condition. a footing loaded eccentrically should be checked for bearing using:

A. An effective area and resulting contact-pressure distribution
B. Only concrete density
C. The full area regardless of eccentricity
D. Pile skin friction

Answer: A B C D

85. For final engineering recommendations, immediate settlement is generally most important in:

A. Intact rock with no joints
B. Only organic soils
C. Only frozen soils
D. Granular soils

Answer: A B C D

86. A geotechnical consultant is performing a design check. primary consolidation settlement is generally most important in:

A. Open-graded base
B. Massive granite
C. Saturated low-permeability clay
D. Dry clean gravel

Answer: A B C D

87. For a project risk review, if a footing influence zone overlaps a compressible clay layer, increasing footing width generally:

A. Eliminates stress increase
B. Prevents all settlement
C. Makes groundwater irrelevant
D. Extends the stress influence deeper

Answer: A B C D

88. During field and design coordination, for a square footing under a centered vertical load, increasing footing area while holding load constant generally:

A. Increases average contact pressure
B. Reverses load direction
C. Does not affect pressure
D. Decreases average contact pressure

Answer: A B C D

Deep Foundations

89. A peer reviewer evaluates the following condition. a pile has unit tip resistance 80 ksf over 4 ft² and average unit side resistance 1.2 ksf over 180 ft². Neglect downdrag. determine nominal axial compression resistance?

A. 268 kips
B. 536 kips
C. 804 kips
D. 1072 kips

Answer: A B C D

90. For final engineering recommendations, a pile has unit tip resistance 100 ksf over 3 ft² and average unit side resistance 1.0 ksf over 200 ft². Neglect downdrag. determine nominal axial compression resistance?

A. 250 kips
B. 750 kips
C. 500 kips
D. 1000 kips

Answer: A B C D

91. A geotechnical consultant is performing a design check. a pile has unit tip resistance 60 ksf over 5 ft² and average unit side resistance 1.5 ksf over 160 ft². Neglect downdrag. determine nominal axial compression resistance?

A. 270 kips
B. 540 kips
C. 1080 kips
D. 810 kips

Answer: A B C D

92. For a project risk review, a pile has unit tip resistance 90 ksf over 4 ft² and average unit side resistance 1.1 ksf over 220 ft². Neglect downdrag. determine nominal axial compression resistance?

A. 1204 kips
B. 301 kips
C. 903 kips
D. 602 kips

Answer: A B C D

93. During field and design coordination, negative skin friction on a pile occurs when:

A. The pile settles more than surrounding soil
B. Groundwater is absent
C. Surrounding soil settles more than the pile
D. The pile is unloaded

Answer: A B C D

94. A peer reviewer evaluates the following condition. a static pile load test most directly provides:

A. Load-movement behavior
B. Only concrete slump
C. Groundwater chemistry
D. Soil color

Answer: A B C D

95. For final engineering recommendations, dynamic pile testing during driving is commonly used to estimate:

A. Consolidation index only
B. Atterberg limits
C. Capacity and driving stresses
D. Rock mineralogy

Answer: A B C D

96. A geotechnical consultant is performing a design check. crosshole sonic logging is used primarily to assess:

A. Soil classification
B. Concrete integrity between access tubes in drilled shafts
C. Wall earth pressure
D. Pile axial load directly

Answer: A B C D

97. For a project risk review, a pile group in clay may need capacity checked as:

A. A shallow footing only
B. A retaining wall only
C. Individual piles only
D. Both sum of individual capacities and a block

Answer: A B C D

98. During field and design coordination, for laterally loaded piles, near-surface soil response is important because:

A. Axial friction is zero
B. Bending and deflection are strongly influenced by upper soil resistance
C. Tip resistance alone controls
D. The pile has no stiffness

Answer: A B C D

99. A peer reviewer evaluates the following condition. driven displacement piles installed in loose sand commonly cause:

A. No ground movement
B. Liquefaction in every case
C. Loss of all shaft resistance
D. Densification and possible heave of nearby piles

Answer: A B C D

100. For final engineering recommendations, a drilled shaft socketed into rock develops resistance from:

A. Side shear and/or base resistance, depending on design assumptions
B. Hydrostatic pressure only
C. Only pile cap weight
D. Only buoyancy

Answer: A B C D

Answer Key

1	2	3	4	5	6	7	8	9	10
C	B	A	B	C	A	A	D	C	A
11	12	13	14	15	16	17	18	19	20
C	C	B	D	A	D	B	A	C	B
21	22	23	24	25	26	27	28	29	30
B	D	B	A	C	B	B	D	D	D
31	32	33	34	35	36	37	38	39	40
C	C	A	B	A	D	D	D	A	A
41	42	43	44	45	46	47	48	49	50
B	D	A	A	B	A	C	C	D	B
51	52	53	54	55	56	57	58	59	60
D	C	D	A	D	C	A	C	D	A
61	62	63	64	65	66	67	68	69	70
B	B	D	A	A	A	C	B	D	B
71	72	73	74	75	76	77	78	79	80
C	C	B	B	C	B	B	C	B	B
81	82	83	84	85	86	87	88	89	90
C	A	D	A	D	C	D	D	B	C
91	92	93	94	95	96	97	98	99	100
B	D	C	A	C	B	D	B	D	A

Use this score as a study diagnostic, not as a predicted licensing result. Review correct guesses as well as missed questions.

Worked Solutions

Site Characterization

1. C - Recovery = recovered length/run length × 100 = 42/5 × 100 = 840%.
2. B - Recovery = recovered length/run length × 100 = 48/6 × 100 = 800%.
3. A - Recovery = recovered length/run length × 100 = 36/5 × 100 = 720%.
4. B - Recovery = recovered length/run length × 100 = 44/5 × 100 = 880%.
5. C - RQD = qualifying sound-core length/run length × 100 = 18/24 × 100 = 75%.
6. A - RQD = qualifying sound-core length/run length × 100 = 20/30 × 100 = 67%.
7. A - RQD = qualifying sound-core length/run length × 100 = 15/25 × 100 = 60%.
8. D - RQD = qualifying sound-core length/run length × 100 = 22/28 × 100 = 79%.
9. C - CPT provides a nearly continuous sounding of cone tip resistance and sleeve friction.
10. A - A thin-walled tube minimizes disturbance in soft cohesive soils.
11. C - More than 50% passing No. 200 makes the soil fine-grained; LL and PI then distinguish silt/clay.
12. C - A standpipe piezometer measures hydraulic head/groundwater elevation.

Soil Mechanics, Laboratory Testing, and Analysis

13. B - $S = wGs/e = 0.18(2.70)/0.65 = 0.748$, or 75%.
14. D - $S = wGs/e = 0.22(2.65)/0.75 = 0.777$, or 78%.
15. A - $S = wGs/e = 0.15(2.68)/0.55 = 0.731$, or 73%.
16. D - $S = wGs/e = 0.25(2.72)/0.82 = 0.829$, or 83%.
17. B - $\sigma'v = \sigma v - u = 120(15) - 500 = 1{,}300$ psf.
18. A - $\sigma'v = \sigma v - u = 118(20) - 800 = 1{,}560$ psf.
19. C - $\sigma'v = \sigma v - u = 125(12) - 420 = 1{,}080$ psf.
20. B - $\sigma'v = \sigma v - u = 115(18) - 650 = 1{,}420$ psf.
21. B - $S = H\, Cc/(1+e0)\, \log10(\sigma'f/\sigma'0) = 12(0.28)/(1+0.8)\log10(2.0) = 6.7$ in.
22. D - $S = H\, Cc/(1+e0)\, \log10(\sigma'f/\sigma'0) = 10(0.22)/(1+0.7)\log10(1.8) = 4.0$ in.
23. B - $S = H\, Cc/(1+e0)\, \log10(\sigma'f/\sigma'0) = 15(0.3)/(1+0.9)\log10(1.5) = 5.0$ in.
24. A - $S = H\, Cc/(1+e0)\, \log10(\sigma'f/\sigma'0) = 8(0.18)/(1+0.6)\log10(2.5) = 4.3$ in.

Construction Observation, Monitoring, QA/QC, and Safety

25. C - $\gamma d = \gamma/(1+w) = 126/1.08 = 116.7$ pcf.
26. B - RC = 116/121 × 100 = 95.9%.
27. B - An inclinometer measures lateral deformation versus depth.
28. D - Rapid loading of low-permeability soil generates excess pore pressure and reduces effective stress.
29. D - Compaction acceptance compares field dry density and moisture with a laboratory Proctor curve.
30. D - Protective systems are generally required at 5 ft or deeper unless the excavation is entirely in stable rock.
31. C - Proofrolling is intended to identify unstable zones requiring undercutting, drying, stabilization, or other remediation.
32. C - The plate provides a reference for vertical settlement of the underlying foundation/fill.

Earthquake Engineering and Dynamic Loads

33. A - Loose, saturated, cohesionless soils are most susceptible to cyclic pore-pressure buildup.
34. B - The pseudo-static method applies an equivalent inertial force, commonly khW.
35. A - $Fh = khW = 0.15(2{,}000) = 300$ kips.
36. D - Measured SPT N is normalized, including energy and overburden corrections.
37. D - Contractive tendency under undrained cyclic loading raises pore pressure and reduces effective stress.
38. D - Soft deposits commonly amplify motions and lengthen site period relative to rock.
39. A - CRR is the soil's cyclic resistance; it is compared with cyclic stress ratio demand.

Earth Structures, Ground Improvement, and Pavement

40. A - $FS = (c'L + N \tan\varphi')/T = [0(120) + 180\tan30°]/90 = 1.15$.

41. B - FS = (c′L + N tanφ′)/T = [0(140) + 190tan32°]/90 = 1.32.
42. D - FS = (c′L + N tanφ′)/T = [5(100) + 170tan28°]/90 = 6.56.
43. A - FS = (c′L + N tanφ′)/T = [0(160) + 210tan35°]/90 = 1.63.
44. A - Vertical drains shorten the drainage path and accelerate consolidation under surcharge.
45. B - Lime reduces plasticity and improves workability/strength in many clayey soils.
46. A - Separation maintains aggregate-base integrity by limiting mixing with subgrade.
47. C - A filter must retain the base soil while allowing drainage without excessive clogging.
48. C - Reinforcement supplies tensile resistance across potential failure surfaces.
49. D - Surcharge/preloading causes consolidation in advance, reducing postconstruction settlement.
50. B - Lower subgrade support requires additional pavement/base structural capacity.
51. D - Filters and drains control pore pressures while preventing migration of soil particles.
52. C - Sliding may localize along the weakest geosynthetic/soil or geosynthetic/geosynthetic interface.
53. D - Aggregate piers reinforce the soil mass, share load, and may provide drainage.

Groundwater and Seepage

54. A - Q = kiA = 0.002(0.5)(100) = 0.100 ft^3/s.
55. D - Q = kiA = 0.001(0.8)(150) = 0.120 ft^3/s.
56. C - Q = kiA = 0.003(0.4)(80) = 0.096 ft^3/s.
57. A - At the critical upward gradient, seepage force offsets submerged unit weight and effective stress approaches zero.
58. C - Closely spaced wellpoints are commonly used to lower groundwater in sands.
59. D - A low-permeability cutoff lengthens/intercepts the seepage path and reduces flow.

Problematic Soil and Rock Conditions

60. A - Expansive minerals swell as water content increases.
61. B - Wetting destroys metastable bonding/fabric, producing collapse under load.
62. B - Water migration to the freezing front is essential for ice-lens growth.
63. D - Karst commonly features voids, pinnacles, sinkholes, and highly irregular rockhead.
64. A - Low soil resistivity is a key indicator of potential electrochemical corrosion.
65. A - Scaling removes loose blocks; mesh, anchors, and catchments control remaining hazards.

Retaining Structures

66. A - $Ka=(1-\sin\varphi)/(1+\sin\varphi)=0.268$; $Pa=\frac{1}{2}Ka\gamma H^2=2.3$ kip/ft, acting H/3 above the base.
67. C - $Ka=(1-\sin\varphi)/(1+\sin\varphi)=0.231$; $Pa=\frac{1}{2}Ka\gamma H^2=3.1$ kip/ft, acting H/3 above the base.
68. B - $Ka=(1-\sin\varphi)/(1+\sin\varphi)=0.306$; $Pa=\frac{1}{2}Ka\gamma H^2=1.9$ kip/ft, acting H/3 above the base.
69. D - $Ka=(1-\sin\varphi)/(1+\sin\varphi)=0.176$; $Pa=\frac{1}{2}Ka\gamma H^2=2.0$ kip/ft, acting H/3 above the base.
70. B - $Ka=(1-\sin\varphi)/(1+\sin\varphi)=0.268$; $Pa=\frac{1}{2}Ka\gamma H^2=5.3$ kip/ft, acting H/3 above the base.
71. C - The centroid of a triangle increasing with depth is H/3 above its base.
72. C - A uniform surcharge produces uniform lateral pressure Kaq.
73. B - Full passive resistance requires relatively large movement and may not remain available.
74. B - Drainage prevents water pressure from adding to lateral earth loads.
75. C - External stability includes sliding, overturning/eccentricity, and foundation bearing/global stability.
76. B - Anchors transfer tensile load into stable ground behind the potential failure zone.
77. B - Struts brace opposing walls and are principally compression members.
78. C - Underpinning provides deeper or supplemental support to protect existing foundations.
79. B - Soil nail walls are commonly built top-down with excavation lifts, nails, and facing.

Shallow Foundations

80. B - qult=23,400 psf; qall=qult/3=7,800 psf=3.9 ksf.
81. C - qult=16,365 psf; qall=qult/3=5,455 psf=2.7 ksf.
82. A - qult=22,300 psf; qall=qult/3=7,433 psf=3.7 ksf.
83. D - qult=29,245 psf; qall=qult/3=9,748 psf=4.9 ksf.
84. A - Eccentricity reduces effective bearing area and can create nonuniform contact pressure.

85. D - Granular soils drain rapidly, so settlement is predominantly immediate.
86. C - Slow dissipation of excess pore pressure governs time-dependent settlement in saturated clay.
87. D - Wider loaded areas influence stresses to greater depths.
88. D - Average contact pressure q=P/A decreases as area increases.

Deep Foundations

89. B - Qn=qpAp+fsAs=80(4)+1.2(180)=536 kips.
90. C - Qn=qpAp+fsAs=100(3)+1.0(200)=500 kips.
91. B - Qn=qpAp+fsAs=60(5)+1.5(160)=540 kips.
92. D - Qn=qpAp+fsAs=90(4)+1.1(220)=602 kips.
93. C - Downward relative movement of soil drags the pile, adding downdrag load.
94. A - The test measures applied load and corresponding pile-head movement.
95. C - Wave measurements can estimate mobilized resistance, stresses, and hammer performance.
96. B - CSL identifies anomalous zones in drilled-shaft concrete between tubes.
97. D - Group failure may occur by individual pile resistance or as a block; the governing mode controls.
98. B - Lateral load transfer and maximum bending commonly involve the upper portion of the pile-soil system.
99. D - Displacement driving can densify sand and displace soil, sometimes heaving adjacent piles.
100. A - Rock sockets can mobilize side shear and base bearing subject to construction quality and design criteria.

Performance Tracker

Knowledge area	Correct	Total	Review notes
Site Characterization		12	
Soil Mechanics, Laboratory Testing, and Analysis		12	
Construction Observation, Monitoring, QA/QC, and Safety		8	
Earthquake Engineering and Dynamic Loads		7	
Earth Structures, Ground Improvement, and Pavement		14	
Groundwater and Seepage		6	
Problematic Soil and Rock Conditions		6	
Retaining Structures		14	
Shallow Foundations		9	
Deep Foundations		12	

Prioritize knowledge areas that remain below your overall average. Redo missed calculations without viewing the worked solution.