PRACTICE EXAM 4: TRANSPORTATION CIVIL PE SIMULATION (100 QUESTIONS)

This expanded practice exam contains 100 questions aligned with the NCEES PE Civil-Transportation specification effective April 2024. The official computer-based exam contains 80 questions and provides 8 hours of examination time within a 9-hour appointment. For this 100-question simulation, allow 10 hours to preserve the official six-minutes-per-question pace. Use SI and U.S. customary units as stated. NCEES does not publish a fixed passing percentage; evaluate performance by domain and review every explanation.

1. During a preliminary engineering report, a roadway pay item has an estimated quantity of 3,600 units and a unit price of $138.00 per unit. What is the estimated item cost? Select the nearest listed value.

A. 397,440.00
B. 596,160.00
C. 496,800.00
D. 745,200.00

2. For a design audit, a grading operation includes 12,750 cubic yards. At a sustained production rate of 910 cubic yards per day, how many working days are required? Select the nearest listed value.

A. 11.21
B. 16.81
C. 21.02
D. 14.01

3. During a multimodal corridor study, a future rehabilitation cost of $1,120,000 occurs in 6 years. Using an annual discount rate of 16.4%, what is its present worth? Select the nearest listed value.

A. 360,238.50
B. 450,298.13
C. 540,357.76
D. 675,447.20

4. For a capital improvement project, a contractor assigns 3 identical crews for 75 days. Each crew installs 555 linear feet per day. What total length can be installed? Select the nearest listed value.

A. 124,875.00
B. 99,900.00
C. 149,850.00
D. 187,312.50

5. During a peer-review calculation, a roadway pay item has an estimated quantity of 3,760 units and a unit price of $146.00 per unit. What is the estimated item cost? Select the nearest listed value.

A. 439,168.00
B. 548,960.00
C. 658,752.00
D. 823,440.00

6. During a preliminary engineering report, a grading operation includes 13,350 cubic yards. At a sustained production rate of 950 cubic yards per day, how many working days are required? Select the nearest listed value.

A. 14.05
B. 11.24
C. 16.86
D. 21.08

7. For a design audit, a future rehabilitation cost of $1,160,000 occurs in 4 years. Using an annual discount rate of 17.2%, what is its present worth? Select the nearest listed value.

A. 491,855.50
B. 737,783.24
C. 922,229.05
D. 614,819.37

8. During a multimodal corridor study, a contractor assigns 4 identical crews for 79 days. Each crew installs 575 linear feet per day. What total length can be installed? Select the nearest listed value.

A. 145,360.00
B. 218,040.00
C. 181,700.00
D. 272,550.00

9. For a capital improvement project, a roadway pay item has an estimated quantity of 3,920 units and a unit price of $154.00 per unit. What is the estimated item cost? Select the nearest listed value.

A. 482,944.00
B. 724,416.00
C. 905,520.00
D. 603,680.00

10. During a peer-review calculation, during the peak hour, 2000 vehicles are counted, and the highest 15-minute volume is 520 vehicles. What is the peak-hour factor? Select the nearest listed value.

A. 0.77
B. 1.15
C. 0.96
D. 1.44

11. During a preliminary engineering report, a freeway lane carries 3025 vehicles per hour at an average speed of 50 miles per hour. Assuming the fundamental relation q = kv, what is density? Select the nearest listed value.

A. 48.40
B. 60.50
C. 72.60
D. 90.75

12. For a design audit, a segment experienced 80 crashes during 146 million vehicle-miles of travel. What is the crash rate in crashes per million vehicle-miles? Select the nearest listed value.

A. 0.55
B. 0.44
C. 0.66
D. 0.83

13. During a multimodal corridor study, current daily traffic is 18,300 vehicles. With compound annual growth of 8.8% for 11 years, what is the forecast daily traffic? Select the nearest listed value.

A. 37,021.92
B. 55,532.88
C. 69,416.10
D. 46,277.40

14. For a capital improvement project, during the peak hour, 2080 vehicles are counted, and the highest 15-minute volume is 540 vehicles. What is the peak-hour factor? Select the nearest listed value.

A. 0.96
B. 0.77
C. 1.15
D. 1.44

15. During a peer-review calculation, a freeway lane carries 3125 vehicles per hour at an average speed of 46 miles per hour. Assuming the fundamental relation q = kv, what is density? Select the nearest listed value.

A. 54.34
B. 81.52
C. 67.93
D. 101.90

16. During a preliminary engineering report, a segment experienced 84 crashes during 154 million vehicle-miles of travel. What is the crash rate in crashes per million vehicle-miles? Select the nearest listed value.

A. 0.44
B. 0.55
C. 0.66
D. 0.83

17. For a design audit, current daily traffic is 18,700 vehicles. With compound annual growth of 9.2% for 11 years, what is the forecast daily traffic? Select the nearest listed value.

A. 39,389.51
B. 49,236.89
C. 59,084.27
D. 73,855.33

18. During a multimodal corridor study, during the peak hour, 2160 vehicles are counted, and the highest 15-minute volume is 560 vehicles. What is the peak-hour factor? Select the nearest listed value.

A. 0.77
B. 1.15
C. 1.44
D. 0.96

19. For a capital improvement project, a freeway lane carries 3225 vehicles per hour at an average speed of 50 miles per hour. Assuming the fundamental relation q = kv, what is density? Select the nearest listed value.

A. 64.50
B. 51.60
C. 77.40
D. 96.75

20. During a peer-review calculation, a segment experienced 88 crashes during 162 million vehicle-miles of travel. What is the crash rate in crashes per million vehicle-miles? Select the nearest listed value.

A. 0.43
B. 0.65
C. 0.54
D. 0.81

21. During a preliminary engineering report, current daily traffic is 19,100 vehicles. With compound annual growth of 9.6% for 11 years, what is the forecast daily traffic? Select the nearest listed value.

A. 52,353.95
B. 41,883.16
C. 62,824.74
D. 78,530.92

22. For a design audit, during the peak hour, 2240 vehicles are counted, and the highest 15-minute volume is 580 vehicles. What is the peak-hour factor? Select the nearest listed value.

A. 0.78
B. 1.16
C. 1.46
D. 0.97

23. During a multimodal corridor study, a freeway lane carries 3325 vehicles per hour at an average speed of 46 miles per hour. Assuming the fundamental relation q = kv, what is density? Select the nearest listed value.

A. 57.82
B. 72.28
C. 86.74
D. 108.42

24. For a capital improvement project, a traveled lane is 12 feet wide with a uniform cross slope of 2.0%. What is the elevation drop from crown to lane edge? Select the nearest listed value.

A. 0.19
B. 0.29
C. 0.24
D. 0.36

25. During a peer-review calculation, a cross section has 3 lanes, each 12 feet wide, plus two 9-foot shoulders. What is the total paved width? Select the nearest listed value.

A. 54.00
B. 43.20
C. 64.80
D. 81.00

26. During a preliminary engineering report, a recoverable roadside slope descends 4 foot vertically over 154 feet horizontally. What is its horizontal-to-vertical ratio? Select the nearest listed value.

A. 30.80
B. 46.20
C. 57.75
D. 38.50

27. For a design audit, a sidewalk segment is 770 feet long and 5 feet wide. What plan area must be constructed? Select the nearest listed value.

A. 3,080.00
B. 4,620.00
C. 3,850.00
D. 5,775.00

28. During a multimodal corridor study, a traveled lane is 12 feet wide with a uniform cross slope of 2.5%. What is the elevation drop from crown to lane edge? Select the nearest listed value.

A. 0.24
B. 0.30
C. 0.36
D. 0.45

29. For a capital improvement project, a cross section has 4 lanes, each 12 feet wide, plus two 10-foot shoulders. What is the total paved width? Select the nearest listed value.

A. 68.00
B. 54.40
C. 81.60
D. 102.00

30. During a peer-review calculation, a recoverable roadside slope descends 2 foot vertically over 162 feet horizontally. What is its horizontal-to-vertical ratio? Select the nearest listed value.

A. 64.80
B. 97.20
C. 121.50
D. 81.00

31. During a preliminary engineering report, a sidewalk segment is 810 feet long and 6 feet wide. What plan area must be constructed? Select the nearest listed value.

A. 3,888.00
B. 5,832.00
C. 4,860.00
D. 7,290.00

32. For a design audit, a traveled lane is 12 feet wide with a uniform cross slope of 3.0%. What is the elevation drop from crown to lane edge? Select the nearest listed value.

A. 0.36
B. 0.29
C. 0.43
D. 0.54

33. During a multimodal corridor study, a cross section has 2 lanes, each 12 feet wide, plus two 8-foot shoulders. What is the total paved width? Select the nearest listed value.

A. 32.00
B. 40.00
C. 48.00
D. 60.00

34. For a capital improvement project, a simple circular curve has radius 2800 feet and central angle 140 degrees. What is its arc length? Select the nearest listed value.

A. 5,473.35
B. 6,841.69
C. 8,210.03
D. 10,262.53

35. During a peer-review calculation, a simple circular curve has radius 2835 feet and intersection angle 142 degrees. What is the tangent length? Select the nearest listed value.

A. 6,586.75
B. 9,880.13
C. 12,350.16
D. 8,233.44

36. During a preliminary engineering report, for a circular curve with radius 2870 feet and central angle 144 degrees, what is the middle ordinate? Select the nearest listed value.

A. 1,586.50
B. 2,379.74
C. 1,983.12
D. 2,974.68

37. For a design audit, for a circular curve with radius 2905 feet and central angle 146 degrees, what is the long chord? Select the nearest listed value.

A. 4,444.90
B. 6,667.36
C. 5,556.13
D. 8,334.19

38. During a multimodal corridor study, a simple circular curve has radius 2940 feet and central angle 148 degrees. What is its arc length? Select the nearest listed value.

A. 6,075.42
B. 7,594.28
C. 9,113.14
D. 11,391.42

39. For a capital improvement project, a simple circular curve has radius 2975 feet and intersection angle 150 degrees. What is the tangent length? Select the nearest listed value.

A. 8,882.28
B. 13,323.42
C. 16,654.28
D. 11,102.85

40. During a peer-review calculation, for a circular curve with radius 3010 feet and central angle 152 degrees, what is the middle ordinate? Select the nearest listed value.

A. 2,281.82
B. 1,825.46
C. 2,738.18
D. 3,422.73

41. During a preliminary engineering report, for a circular curve with radius 3045 feet and central angle 154 degrees, what is the long chord? Select the nearest listed value.

A. 4,747.13
B. 5,933.91
C. 7,120.69
D. 8,900.86

42. For a design audit, a simple circular curve has radius 3080 feet and central angle 156 degrees. What is its arc length? Select the nearest listed value.

A. 6,708.77
B. 10,063.15
C. 8,385.96
D. 12,578.94

43. During a multimodal corridor study, a simple circular curve has radius 3115 feet and intersection angle 158 degrees. What is the tangent length? Select the nearest listed value.

A. 16,025.29
B. 12,820.23
C. 19,230.35
D. 24,037.94

44. For a capital improvement project, for a circular curve with radius 3150 feet and central angle 160 degrees, what is the middle ordinate? Select the nearest listed value.

A. 2,082.41
B. 3,123.61
C. 3,904.52
D. 2,603.01

45. During a peer-review calculation, a vertical curve connects grades of 4.50% and +11.50%. What is the algebraic grade difference A? Select the nearest listed value.

A. 5.60
B. 8.40
C. 7.00
D. 10.50

46. During a preliminary engineering report, a vertical curve is 2125 feet long and has an algebraic grade difference of 5%. What is its K value? Select the nearest listed value.

A. 340.00
B. 510.00
C. 637.50
D. 425.00

47. For a design audit, a tangent begins at elevation 686.00 feet and rises at 8.20% for 920 feet. What is the ending elevation? Select the nearest listed value.

A. 761.44
B. 609.15
C. 913.73
D. 1,142.16

48. During a multimodal corridor study, an overhead structure has a low-chord elevation of 22.80 feet above a datum. The roadway surface is at elevation 4.50 feet. What is the vertical clearance? Select the nearest listed value.

A. 14.64
B. 18.30
C. 21.96
D. 27.45

49. For a capital improvement project, a vertical curve connects grades of 4.90% and +12.10%. What is the algebraic grade difference A? Select the nearest listed value.

A. 5.76
B. 8.64
C. 7.20
D. 10.80

50. During a peer-review calculation, a vertical curve is 2225 feet long and has an algebraic grade difference of 4%. What is its K value? Select the nearest listed value.

A. 445.00
B. 556.25
C. 667.50
D. 834.38

51. During a preliminary engineering report, a tangent begins at elevation 698.00 feet and rises at 8.60% for 960 feet. What is the ending elevation? Select the nearest listed value.

A. 624.45
B. 936.67
C. 1,170.84
D. 780.56

52. For a design audit, an overhead structure has a low-chord elevation of 23.20 feet above a datum. The roadway surface is at elevation 5.50 feet. What is the vertical clearance? Select the nearest listed value.

A. 17.70
B. 14.16
C. 21.24
D. 26.55

53. During a multimodal corridor study, a vertical curve connects grades of 5.30% and +12.70%. What is the algebraic grade difference A? Select the nearest listed value.

A. 5.92
B. 7.40
C. 8.88
D. 11.10

54. For a capital improvement project, a vertical curve is 2325 feet long and has an algebraic grade difference of 8%. What is its K value? Select the nearest listed value.

A. 290.62
B. 232.50
C. 348.74
D. 435.93

55. During a peer-review calculation, a tangent begins at elevation 710.00 feet and rises at 9.00% for 1000 feet. What is the ending elevation? Select the nearest listed value.

A. 640.00
B. 960.00
C. 800.00
D. 1,200.00

56. During a preliminary engineering report, a vehicle approaches an intersection at 150 miles per hour. If the design gap is 6 seconds, what distance does it travel during the gap? Select the nearest listed value.

A. 1,056.00
B. 1,584.00
C. 1,980.00
D. 1,320.00

57. For a design audit, a left-turn bay must store 69 passenger vehicles. Using 25 feet of storage per vehicle, what storage length is required? Select the nearest listed value.

A. 1,380.00
B. 2,070.00
C. 1,725.00
D. 2,587.50

58. During a multimodal corridor study, a channelized intersection uses a circular curb return with radius 169 feet through 132 degrees. What is the curb-return arc length? Select the nearest listed value.

A. 389.35
B. 311.48
C. 467.22
D. 584.03

59. For a capital improvement project, an arterial intersection has 2 through lanes in each direction, 12-foot lanes, and a 79-foot median. What is the curb-to-curb crossing width, excluding shoulders? Select the nearest listed value.

A. 101.60
B. 127.00
C. 152.40
D. 190.50

60. During a peer-review calculation, a vehicle approaches an intersection at 158 miles per hour. If the design gap is 6 seconds, what distance does it travel during the gap? Select the nearest listed value.

A. 1,112.32
B. 1,668.48
C. 2,085.60
D. 1,390.40

61. During a preliminary engineering report, a left-turn bay must store 73 passenger vehicles. Using 25 feet of storage per vehicle, what storage length is required? Select the nearest listed value.

A. 1,460.00
B. 1,825.00
C. 2,190.00
D. 2,737.50

62. For a design audit, a channelized intersection uses a circular curb return with radius 177 feet through 136 degrees. What is the curb-return arc length? Select the nearest listed value.

A. 336.11
B. 504.17
C. 630.21
D. 420.14

63. During a multimodal corridor study, an arterial intersection has 3 through lanes in each direction, 12-foot lanes, and a 83-foot median. What is the curb-to-curb crossing width, excluding shoulders? Select the nearest listed value.

A. 155.00
B. 124.00
C. 186.00
D. 232.50

64. For a capital improvement project, a vehicle approaches an intersection at 166 miles per hour. If the design gap is 6 seconds, what distance does it travel during the gap? Select the nearest listed value.

A. 1,168.64
B. 1,752.96
C. 1,460.80
D. 2,191.20

65. During a peer-review calculation, a left-turn bay must store 77 passenger vehicles. Using 25 feet of storage per vehicle, what storage length is required? Select the nearest listed value.

A. 1,540.00
B. 2,310.00
C. 2,887.50
D. 1,925.00

66. During a preliminary engineering report, a signal has a 390-second cycle, 92 seconds of displayed green, and 4 seconds of phase lost time. What effective-green ratio applies to the phase? Select the nearest listed value.

A. 0.23
B. 0.18
C. 0.28
D. 0.35

67. For a design audit, a lane group has saturation flow of 1900 vehicles per hour of green and an effective-green ratio of 1.57. What is its capacity? Select the nearest listed value.

A. 2,386.40
B. 3,579.60
C. 2,983.00
D. 4,474.50

68. During a multimodal corridor study, a pedestrian must cross 184 feet. Using a 7-second start interval and walking speed of 3.5 feet per second, what total pedestrian timing is required? Select the nearest listed value.

A. 47.66
B. 59.57
C. 71.48
D. 89.36

69. For a capital improvement project, a four-phase signal has 9.80 seconds of lost time per phase. What is the total lost time per cycle? Select the nearest listed value.

A. 31.36
B. 47.04
C. 39.20
D. 58.80

70. During a peer-review calculation, a signal has a 410-second cycle, 96 seconds of displayed green, and 4 seconds of phase lost time. What effective-green ratio applies to the phase? Select the nearest listed value.

A. 0.18
B. 0.26
C. 0.33
D. 0.22

71. During a preliminary engineering report, a lane group has saturation flow of 1900 vehicles per hour of green and an effective-green ratio of 1.65. What is its capacity? Select the nearest listed value.

A. 2,508.00
B. 3,135.00
C. 3,762.00
D. 4,702.50

72. For a design audit, a pedestrian must cross 192 feet. Using a 7-second start interval and walking speed of 3.5 feet per second, what total pedestrian timing is required? Select the nearest listed value.

A. 61.86
B. 49.49
C. 74.23
D. 92.79

73. During a multimodal corridor study, for a work-zone taper on a roadway operating at 35 mph, use L = WS^2/60 with offset W = 12 feet. What taper length results? Select the nearest listed value.

A. 196.00
B. 294.00
C. 245.00
D. 367.50

74. For a capital improvement project, a channelizing line contains 70 devices at 690-foot spacing. What distance separates the first and last device? Select the nearest listed value.

A. 38,088.00
B. 57,132.00
C. 71,415.00
D. 47,610.00

75. During a peer-review calculation, a broken lane line extends 4300 feet using a 10-foot stripe and 30-foot gap. Approximately how many complete stripe-gap cycles fit in the segment? Select the nearest listed value.

A. 107.50
B. 86.00
C. 129.00
D. 161.25

76. During a preliminary engineering report, a temporary warning sequence should provide 8 seconds of preview at 108 mph. What advance distance corresponds to that travel time? Select the nearest listed value.

A. 1,013.76
B. 1,267.20
C. 1,520.64
D. 1,900.80

77. For a design audit, for a work-zone taper on a roadway operating at 55 mph, use L = WS^2/60 with offset W = 12 feet. What taper length results? Select the nearest listed value.

A. 484.00
B. 726.00
C. 907.50
D. 605.00

78. During a multimodal corridor study, a channelizing line contains 74 devices at 730-foot spacing. What distance separates the first and last device? Select the nearest listed value.

A. 42,632.00
B. 53,290.00
C. 63,948.00
D. 79,935.00

79. For a capital improvement project, a broken lane line extends 4500 feet using a 10-foot stripe and 30-foot gap. Approximately how many complete stripe-gap cycles fit in the segment? Select the nearest listed value.

A. 90.00
B. 135.00
C. 112.50
D. 168.75

80. During a peer-review calculation, compacted soil has moist unit weight 245.00 pcf and water content 38.0%. What is its dry unit weight? Select the nearest listed value.

A. 177.54
B. 142.03
C. 213.05
D. 266.31

81. During a preliminary engineering report, a field dry unit weight is 240.00 pcf and laboratory maximum dry unit weight is 246.00 pcf. What is relative compaction? Select the nearest listed value.

A. 78.05
B. 117.07
C. 97.56
D. 146.34

82. For a design audit, a soil element contains 1.66 cubic foot of voids and 1.20 cubic foot of solids. What is the void ratio? Select the nearest listed value.

A. 1.38
B. 1.10
C. 1.66
D. 2.07

83. During a multimodal corridor study, a design lane carries 2160 trucks per day, and the adopted equivalency factor is 4.95 ESAL per truck. What is the daily ESAL loading? Select the nearest listed value.

A. 8,553.60
B. 12,830.40
C. 16,038.00
D. 10,692.00

84. For a capital improvement project, compacted soil has moist unit weight 253.00 pcf and water content 40.0%. What is its dry unit weight? Select the nearest listed value.

A. 144.57
B. 180.71
C. 216.85
D. 271.06

85. During a peer-review calculation, a field dry unit weight is 248.00 pcf and laboratory maximum dry unit weight is 254.00 pcf. What is relative compaction? Select the nearest listed value.

A. 78.11
B. 97.64
C. 117.17
D. 146.46

86. During a preliminary engineering report, a soil element contains 1.74 cubic foot of voids and 1.24 cubic foot of solids. What is the void ratio? Select the nearest listed value.

A. 1.12
B. 1.68
C. 2.10
D. 1.40

87. For a design audit, a design lane carries 2240 trucks per day, and the adopted equivalency factor is 5.15 ESAL per truck. What is the daily ESAL loading? Select the nearest listed value.

A. 11,536.00
B. 9,228.80
C. 13,843.20
D. 17,304.00

88. During a multimodal corridor study, compacted soil has moist unit weight 261.00 pcf and water content 42.0%. What is its dry unit weight? Select the nearest listed value.

A. 147.04
B. 220.56
C. 183.80
D. 275.70

89. For a capital improvement project, using Q = CiA, find peak runoff for C = 1.25, rainfall intensity i = 9.20 inches per hour, and drainage area A = 78 acres. Select the nearest listed value.

A. 717.60
B. 1,076.40
C. 1,345.50
D. 897.00

90. During a peer-review calculation, a circular storm drain has inside diameter 8.60 feet. What is its full cross-sectional flow area? Select the nearest listed value.

A. 46.47
B. 58.09
C. 69.71
D. 87.14

91. During a preliminary engineering report, a culvert conveys 172.00 cubic feet per second through a flow area of 18.40 square feet. What is mean velocity? Select the nearest listed value.

A. 9.35
B. 7.48
C. 11.22
D. 14.02

92. For a design audit, a rectangular roadside channel carries water 7.80 feet deep across a bottom width of 71 feet. What is the flow area, neglecting side-slope contribution? Select the nearest listed value.

A. 443.04
B. 664.56
C. 553.80
D. 830.70

93. During a multimodal corridor study, using Q = CiA, find peak runoff for C = 1.29, rainfall intensity i = 9.60 inches per hour, and drainage area A = 82 acres. Select the nearest listed value.

A. 812.39
B. 1,015.49
C. 1,218.59
D. 1,523.24

94. For a capital improvement project, a circular storm drain has inside diameter 9.00 feet. What is its full cross-sectional flow area? Select the nearest listed value.

A. 50.90
B. 76.34
C. 63.62
D. 95.43

95. During a peer-review calculation, a culvert conveys 180.00 cubic feet per second through a flow area of 19.20 square feet. What is mean velocity? Select the nearest listed value.

A. 7.50
B. 11.24
C. 14.05
D. 9.37

96. During a preliminary engineering report, a rectangular roadside channel carries water 8.20 feet deep across a bottom width of 75 feet. What is the flow area, neglecting side-slope contribution? Select the nearest listed value.

A. 615.00
B. 492.00
C. 738.00
D. 922.50

97. For a design audit, using Q = CiA, find peak runoff for C = 1.33, rainfall intensity i = 10.00 inches per hour, and drainage area A = 86 acres. Select the nearest listed value.

A. 915.04
B. 1,372.56
C. 1,143.80
D. 1,715.70

98. During a multimodal corridor study, a circular storm drain has inside diameter 9.40 feet. What is its full cross-sectional flow area? Select the nearest listed value.

A. 69.40
B. 55.52
C. 83.28
D. 104.10

99. For a capital improvement project, a culvert conveys 188.00 cubic feet per second through a flow area of 20.00 square feet. What is mean velocity? Select the nearest listed value.

A. 7.52
B. 11.28
C. 14.10
D. 9.40

100. During a peer-review calculation, a rectangular roadside channel carries water 8.60 feet deep across a bottom width of 79 feet. What is the flow area, neglecting side-slope contribution? Select the nearest listed value.

A. 543.52
B. 679.40
C. 815.28
D. 1,019.10

Practice Exam 4: Answer Key and Explanations

1. C — Using the stated data, the cost is quantity times unit price: 3,600 x $138.00 = $496,800.00. Therefore, the keyed value is the only option consistent with the governing relationship. A quantity takeoff becomes a cost only after multiplication by the applicable bid or planning unit price. The distractors represent omitted factors, reversed operations, or failure to discount or scale the.

2. D — Using the stated data, duration equals work divided by production, or 12,750/910 = 14.01 days. Therefore, the keyed value is the only option consistent with the governing relationship. Production-based duration links measured scope to schedule time before logic ties are applied. The distractors represent omitted factors, reversed operations, or failure to discount or scale the work correctly.

3. B — Using the stated data, discounting gives $1,120,000/(1+0.164)^6 = $450,298.13. Therefore, the keyed value is the only option consistent with the governing relationship. Present worth converts a future expenditure to an equivalent value at the analysis date. The distractors represent omitted factors, reversed operations, or failure to discount or scale the work correctly.

4. A — Using the stated data, total output is 3 x 75 x 555 = 124,875.00 feet. Therefore, the keyed value is the only option consistent with the governing relationship. Total planned output is the product of crew count, available days, and daily productivity. The distractors represent omitted factors, reversed operations, or failure to discount or scale the work correctly.

5. B — Using the stated data, the cost is quantity times unit price: 3,760 x $146.00 = $548,960.00. Therefore, the keyed value is the only option consistent with the governing relationship. A quantity takeoff becomes a cost only after multiplication by the applicable bid or planning unit price. The distractors represent omitted factors, reversed operations, or failure to discount or scale the.

6. A — Using the stated data, duration equals work divided by production, or 13,350/950 = 14.05 days. Therefore, the keyed value is the only option consistent with the governing relationship. Production-based duration links measured scope to schedule time before logic ties are applied. The distractors represent omitted factors, reversed operations, or failure to discount or scale the work correctly.

7. D — Using the stated data, discounting gives $1,160,000/(1+0.172)^4 = $614,819.37. Therefore, the keyed value is the only option consistent with the governing relationship. Present worth converts a future expenditure to an equivalent value at the analysis date. The distractors represent omitted factors, reversed operations, or failure to discount or scale the work correctly.

8. C — Using the stated data, total output is 4 x 79 x 575 = 181,700.00 feet. Therefore, the keyed value is the only option consistent with the governing relationship. Total planned output is the product of crew count, available days, and daily productivity. The distractors represent omitted factors, reversed operations, or failure to discount or scale the work correctly.

9. D — Using the stated data, the cost is quantity times unit price: 3,920 x $154.00 = $603,680.00. Therefore, the keyed value is the only option consistent with the governing relationship. A quantity takeoff becomes a cost only after multiplication by the applicable bid or planning unit price. The distractors represent omitted factors, reversed operations, or failure to discount or scale the.

10. C — Using the stated data, PHF = 2000/(4 x 520) = 0.96. Therefore, the keyed value is the only option consistent with the governing relationship. The factor compares the full-hour volume with the hourly equivalent of the most intense quarter hour. The incorrect choices reflect common mistakes involving peak conversion, exposure, unit consistency, or simple rather than compound growth.

11. B — Using the stated data, density is flow divided by speed: 3025/50 = 60.50 vehicles per mile. Therefore, the keyed value is the only option consistent with the governing relationship. The fundamental traffic-flow relationship requires consistent hourly flow and speed units. The incorrect choices reflect common mistakes involving peak conversion, exposure, unit consistency, or simple rather than compound growth.

12. A — Using the stated data, the normalized crash rate is 80/146 = 0.55 crashes per million vehicle-miles. Therefore, the keyed value is the only option consistent with the governing relationship. Exposure normalization permits safety comparisons among facilities carrying different traffic volumes over different lengths. The incorrect choices reflect common mistakes involving peak conversion, exposure, unit consistency, or simple rather than compound.

13. D — Using the stated data, compound growth gives 18,300(1+0.088)^11 = 46,277.40 vehicles per day. Therefore, the keyed value is the only option consistent with the governing relationship. Compound forecasting applies growth to the increasing total each year rather than only to the original base. The incorrect choices reflect common mistakes involving peak conversion, exposure, unit consistency, or simple rather than compound.

14. A — Using the stated data, PHF = 2080/(4 x 540) = 0.96. Therefore, the keyed value is the only option consistent with the governing relationship. The factor compares the full-hour volume with the hourly equivalent of the most intense quarter hour. The incorrect choices reflect common mistakes involving peak conversion, exposure, unit consistency, or simple rather than compound growth.

15. C — Using the stated data, density is flow divided by speed: 3125/46 = 67.93 vehicles per mile. Therefore, the keyed value is the only option consistent with the governing relationship. The fundamental traffic-flow relationship requires consistent hourly flow and speed units. The incorrect choices reflect common mistakes involving peak conversion, exposure, unit consistency, or simple rather than compound growth.

16. B — Using the stated data, the normalized crash rate is 84/154 = 0.55 crashes per million vehicle-miles. Therefore, the keyed value is the only option consistent with the governing relationship. Exposure normalization permits safety comparisons among facilities carrying different traffic volumes over different lengths. The incorrect choices reflect common mistakes involving peak conversion, exposure, unit consistency, or simple rather than compound.

17. B — Using the stated data, compound growth gives 18,700(1+0.092)^11 = 49,236.89 vehicles per day. Therefore, the keyed value is the only option consistent with the governing relationship. Compound forecasting applies growth to the increasing total each year rather than only to the original base. The incorrect choices reflect common mistakes involving peak conversion, exposure, unit consistency, or simple rather than compound.

18. D — Using the stated data, PHF = 2160/(4 x 560) = 0.96. Therefore, the keyed value is the only option consistent with the governing relationship. The factor compares the full-hour volume with the hourly equivalent of the most intense quarter hour. The incorrect choices reflect common mistakes involving peak conversion, exposure, unit consistency, or simple rather than compound growth.

19. A — Using the stated data, density is flow divided by speed: 3225/50 = 64.50 vehicles per mile. Therefore, the keyed value is the only option consistent with the governing relationship. The fundamental traffic-flow relationship requires consistent hourly flow and speed units. The incorrect choices reflect common mistakes involving peak conversion, exposure, unit consistency, or simple rather than compound growth.

20. C — Using the stated data, the normalized crash rate is 88/162 = 0.54 crashes per million vehicle-miles. Therefore, the keyed value is the only option consistent with the governing relationship. Exposure normalization permits safety comparisons among facilities carrying different traffic volumes over different lengths. The incorrect choices reflect common mistakes involving peak conversion, exposure, unit consistency, or simple rather than compound.

21. A — Using the stated data, compound growth gives 19,100(1+0.096)^11 = 52,353.95 vehicles per day. Therefore, the keyed value is the only option consistent with the governing relationship. Compound forecasting applies growth to the increasing total each year rather than only to the original base. The incorrect choices reflect common mistakes involving peak conversion, exposure, unit consistency, or simple rather than compound.

22. D — Using the stated data, PHF = 2240/(4 x 580) = 0.97. Therefore, the keyed value is the only option consistent with the governing relationship. The factor compares the full-hour volume with the hourly equivalent of the most intense quarter hour. The incorrect choices reflect common mistakes involving peak conversion, exposure, unit consistency, or simple rather than compound growth.

23. B — Using the stated data, density is flow divided by speed: 3325/46 = 72.28 vehicles per mile. Therefore, the keyed value is the only option consistent with the governing relationship. The fundamental traffic-flow relationship requires consistent hourly flow and speed units. The incorrect choices reflect common mistakes involving peak conversion, exposure, unit consistency, or simple rather than compound growth.

24. C — Using the stated data, drop equals width times decimal slope: 12 x 0.020 = 0.24 feet. Therefore, the keyed value is the only option consistent with the governing relationship. Cross slope is a dimensionless rise-over-run ratio, so percent must be converted to decimal form. The distractors arise from ignoring one side, treating percent as a whole number, or confusing a.

25. A — Using the stated data, paved width is 3 x 12 + 2 x 9 = 54.00 feet. Therefore, the keyed value is the only option consistent with the governing relationship. Every traveled lane and both shoulders contribute to the full paved platform width. The distractors arise from ignoring one side, treating percent as a whole number, or confusing a ratio.

26. D — Using the stated data, the H:V ratio is 154/4 = 38.50 to 1. Therefore, the keyed value is the only option consistent with the governing relationship. Roadside slopes are commonly described as horizontal distance for each unit of vertical change. The distractors arise from ignoring one side, treating percent as a whole number, or confusing a ratio with its reciprocal.

27. C — Using the stated data, rectangular area is 770 x 5 = 3,850.00 square feet. Therefore, the keyed value is the only option consistent with the governing relationship. Plan area supports material quantity calculations when thickness is handled as a separate dimension. The distractors arise from ignoring one side, treating percent as a whole number, or confusing a ratio with its.

28. B — Using the stated data, drop equals width times decimal slope: 12 x 0.025 = 0.30 feet. Therefore, the keyed value is the only option consistent with the governing relationship. Cross slope is a dimensionless rise-over-run ratio, so percent must be converted to decimal form. The distractors arise from ignoring one side, treating percent as a whole number, or confusing a.

29. A — Using the stated data, paved width is 4 x 12 + 2 x 10 = 68.00 feet. Therefore, the keyed value is the only option consistent with the governing relationship. Every traveled lane and both shoulders contribute to the full paved platform width. The distractors arise from ignoring one side, treating percent as a whole number, or confusing a ratio.

30. D — Using the stated data, the H:V ratio is 162/2 = 81.00 to 1. Therefore, the keyed value is the only option consistent with the governing relationship. Roadside slopes are commonly described as horizontal distance for each unit of vertical change. The distractors arise from ignoring one side, treating percent as a whole number, or confusing a ratio with its reciprocal.

31. C — Using the stated data, rectangular area is 810 x 6 = 4,860.00 square feet. Therefore, the keyed value is the only option consistent with the governing relationship. Plan area supports material quantity calculations when thickness is handled as a separate dimension. The distractors arise from ignoring one side, treating percent as a whole number, or confusing a ratio with its.

32. A — Using the stated data, drop equals width times decimal slope: 12 x 0.030 = 0.36 feet. Therefore, the keyed value is the only option consistent with the governing relationship. Cross slope is a dimensionless rise-over-run ratio, so percent must be converted to decimal form. The distractors arise from ignoring one side, treating percent as a whole number, or confusing a.

33. B — Using the stated data, paved width is 2 x 12 + 2 x 8 = 40.00 feet. Therefore, the keyed value is the only option consistent with the governing relationship. Every traveled lane and both shoulders contribute to the full paved platform width. The distractors arise from ignoring one side, treating percent as a whole number, or confusing a ratio.

34. B — Using the stated data, arc length is pi(2800)(140)/180 = 6841.69 feet. Therefore, the keyed value is the only option consistent with the governing relationship. The degree angle must be converted through the pi-over-180 factor when computing circular arc length. The alternatives correspond to using the full angle instead of the half angle, omitting conversion, or selecting a different curve element.

35. D — Using the stated data, T = R tan(delta/2) = 2835 tan(142/2) = 8233.44 feet. Therefore, the keyed value is the only option consistent with the governing relationship. The tangent distance runs from the point of intersection to either tangent point. The alternatives correspond to using the full angle instead of the half angle, omitting conversion, or selecting a different curve.

36. C — Using the stated data, M = R[1-cos(delta/2)] = 1983.12 feet. Therefore, the keyed value is the only option consistent with the governing relationship. The middle ordinate is measured from the midpoint of the long chord to the curve along the radial line. The alternatives correspond to using the full angle instead of the half angle, omitting conversion, or selecting a.

37. C — Using the stated data, LC = 2R sin(delta/2) = 5556.13 feet. Therefore, the keyed value is the only option consistent with the governing relationship. The long chord directly joins the beginning and end points of the circular curve. The alternatives correspond to using the full angle instead of the half angle, omitting conversion, or selecting a different curve element.

38. B — Using the stated data, arc length is pi(2940)(148)/180 = 7594.28 feet. Therefore, the keyed value is the only option consistent with the governing relationship. The degree angle must be converted through the pi-over-180 factor when computing circular arc length. The alternatives correspond to using the full angle instead of the half angle, omitting conversion, or selecting a different curve element.

39. D — Using the stated data, T = R tan(delta/2) = 2975 tan(150/2) = 11102.85 feet. Therefore, the keyed value is the only option consistent with the governing relationship. The tangent distance runs from the point of intersection to either tangent point. The alternatives correspond to using the full angle instead of the half angle, omitting conversion, or selecting a different curve.

40. A — Using the stated data, M = R[1-cos(delta/2)] = 2281.82 feet. Therefore, the keyed value is the only option consistent with the governing relationship. The middle ordinate is measured from the midpoint of the long chord to the curve along the radial line. The alternatives correspond to using the full angle instead of the half angle, omitting conversion, or selecting a.

41. B — Using the stated data, LC = 2R sin(delta/2) = 5933.91 feet. Therefore, the keyed value is the only option consistent with the governing relationship. The long chord directly joins the beginning and end points of the circular curve. The alternatives correspond to using the full angle instead of the half angle, omitting conversion, or selecting a different curve element.

42. C — Using the stated data, arc length is pi(3080)(156)/180 = 8385.96 feet. Therefore, the keyed value is the only option consistent with the governing relationship. The degree angle must be converted through the pi-over-180 factor when computing circular arc length. The alternatives correspond to using the full angle instead of the half angle, omitting conversion, or selecting a different curve element.

43. A — Using the stated data, T = R tan(delta/2) = 3115 tan(158/2) = 16025.29 feet. Therefore, the keyed value is the only option consistent with the governing relationship. The tangent distance runs from the point of intersection to either tangent point. The alternatives correspond to using the full angle instead of the half angle, omitting conversion, or selecting a different curve.

44. D — Using the stated data, M = R[1-cos(delta/2)] = 2603.01 feet. Therefore, the keyed value is the only option consistent with the governing relationship. The middle ordinate is measured from the midpoint of the long chord to the curve along the radial line. The alternatives correspond to using the full angle instead of the half angle, omitting conversion, or selecting a.

45. C — Using the stated data, A is the absolute grade difference: |11.50-(4.50)| = 7.00%. Therefore, the keyed value is the only option consistent with the governing relationship. Opposite-signed grades add in magnitude when determining the vertical curve's algebraic grade difference. The distractors reflect sign errors, percent conversion mistakes, reciprocal K calculations, or addition where an elevation difference is required.

46. D — Using the stated data, K equals length divided by algebraic grade difference: 2125/5 = 425.00 feet per percent. Therefore, the keyed value is the only option consistent with the governing relationship. K expresses the horizontal length supplied for each percentage point of grade change. The distractors reflect sign errors, percent conversion mistakes, reciprocal K calculations, or addition where an elevation.

47. A — Using the stated data, elevation change is 0.082 x 920 = 75.44 feet, yielding 761.44 feet. Therefore, the keyed value is the only option consistent with the governing relationship. A positive decimal grade increases elevation in the direction of stationing. The distractors reflect sign errors, percent conversion mistakes, reciprocal K calculations, or addition where an elevation difference is required.

48. B — Using the stated data, clearance is the elevation difference: 22.80-4.50 = 18.30 feet. Therefore, the keyed value is the only option consistent with the governing relationship. Vertical clearance is measured between the roadway surface and the controlling overhead obstruction. The distractors reflect sign errors, percent conversion mistakes, reciprocal K calculations, or addition where an elevation difference is required.

49. C — Using the stated data, A is the absolute grade difference: |12.10-(4.90)| = 7.20%. Therefore, the keyed value is the only option consistent with the governing relationship. Opposite-signed grades add in magnitude when determining the vertical curve's algebraic grade difference. The distractors reflect sign errors, percent conversion mistakes, reciprocal K calculations, or addition where an elevation difference is required.

50. B — Using the stated data, K equals length divided by algebraic grade difference: 2225/4 = 556.25 feet per percent. Therefore, the keyed value is the only option consistent with the governing relationship. K expresses the horizontal length supplied for each percentage point of grade change. The distractors reflect sign errors, percent conversion mistakes, reciprocal K calculations, or addition where an elevation.

51. D — Using the stated data, elevation change is 0.086 x 960 = 82.56 feet, yielding 780.56 feet. Therefore, the keyed value is the only option consistent with the governing relationship. A positive decimal grade increases elevation in the direction of stationing. The distractors reflect sign errors, percent conversion mistakes, reciprocal K calculations, or addition where an elevation difference is required.

52. A — Using the stated data, clearance is the elevation difference: 23.20-5.50 = 17.70 feet. Therefore, the keyed value is the only option consistent with the governing relationship. Vertical clearance is measured between the roadway surface and the controlling overhead obstruction. The distractors reflect sign errors, percent conversion mistakes, reciprocal K calculations, or addition where an elevation difference is required.

53. B — Using the stated data, A is the absolute grade difference: |12.70-(5.30)| = 7.40%. Therefore, the keyed value is the only option consistent with the governing relationship. Opposite-signed grades add in magnitude when determining the vertical curve's algebraic grade difference. The distractors reflect sign errors, percent conversion mistakes, reciprocal K calculations, or addition where an elevation difference is required.

54. A — Using the stated data, K equals length divided by algebraic grade difference: 2325/8 = 290.62 feet per percent. Therefore, the keyed value is the only option consistent with the governing relationship. K expresses the horizontal length supplied for each percentage point of grade change. The distractors reflect sign errors, percent conversion mistakes, reciprocal K calculations, or addition where an elevation.

55. C — Using the stated data, elevation change is 0.090 x 1000 = 90.00 feet, yielding 800.00 feet. Therefore, the keyed value is the only option consistent with the governing relationship. A positive decimal grade increases elevation in the direction of stationing. The distractors reflect sign errors, percent conversion mistakes, reciprocal K calculations, or addition where an elevation difference is required.

56. D — Using the stated data, distance is 150 x 1.4667 x 6 = 1320.00 feet. Therefore, the keyed value is the only option consistent with the governing relationship. The speed conversion from miles per hour to feet per second is required before multiplying by time. The alternatives result from omitting a direction, forgetting the median, failing to convert speed, or using.

57. C — Using the stated data, storage length is 69 x 25 = 1725.00 feet. Therefore, the keyed value is the only option consistent with the governing relationship. Queue storage is the product of design vehicle count and the adopted effective space per queued vehicle. The alternatives result from omitting a direction, forgetting the median, failing to convert speed, or using degrees.

58. A — Using the stated data, arc length is pi(169)(132)/180 = 389.35 feet. Therefore, the keyed value is the only option consistent with the governing relationship. Curb-return length follows the same circular arc relation used for other horizontal curves. The alternatives result from omitting a direction, forgetting the median, failing to convert speed, or using degrees directly without circular conversion.

59. B — Using the stated data, width is 2 x 2 x 12 + 79 = 127.00 feet. Therefore, the keyed value is the only option consistent with the governing relationship. The crossing includes directional traveled ways on both sides plus the central median. The alternatives result from omitting a direction, forgetting the median, failing to convert speed, or using degrees directly.

60. D — Using the stated data, distance is 158 x 1.4667 x 6 = 1390.40 feet. Therefore, the keyed value is the only option consistent with the governing relationship. The speed conversion from miles per hour to feet per second is required before multiplying by time. The alternatives result from omitting a direction, forgetting the median, failing to convert speed, or using.

61. B — Using the stated data, storage length is 73 x 25 = 1825.00 feet. Therefore, the keyed value is the only option consistent with the governing relationship. Queue storage is the product of design vehicle count and the adopted effective space per queued vehicle. The alternatives result from omitting a direction, forgetting the median, failing to convert speed, or using degrees.

62. D — Using the stated data, arc length is pi(177)(136)/180 = 420.14 feet. Therefore, the keyed value is the only option consistent with the governing relationship. Curb-return length follows the same circular arc relation used for other horizontal curves. The alternatives result from omitting a direction, forgetting the median, failing to convert speed, or using degrees directly without circular conversion.

63. A — Using the stated data, width is 2 x 3 x 12 + 83 = 155.00 feet. Therefore, the keyed value is the only option consistent with the governing relationship. The crossing includes directional traveled ways on both sides plus the central median. The alternatives result from omitting a direction, forgetting the median, failing to convert speed, or using degrees directly.

64. C — Using the stated data, distance is 166 x 1.4667 x 6 = 1460.80 feet. Therefore, the keyed value is the only option consistent with the governing relationship. The speed conversion from miles per hour to feet per second is required before multiplying by time. The alternatives result from omitting a direction, forgetting the median, failing to convert speed, or using.

65. D — Using the stated data, storage length is 77 x 25 = 1925.00 feet. Therefore, the keyed value is the only option consistent with the governing relationship. Queue storage is the product of design vehicle count and the adopted effective space per queued vehicle. The alternatives result from omitting a direction, forgetting the median, failing to convert speed, or using degrees.

66. A — Using the stated data, effective green ratio is (92-4)/390 = 0.23. Therefore, the keyed value is the only option consistent with the governing relationship. Only effective green, after subtracting lost time, contributes to the usable fraction of the cycle. The distractors reflect use of displayed rather than effective green, omission of startup time, or division where proportional capacity requires multiplication.

67. C — Using the stated data, capacity is saturation flow times green ratio: 1900 x 1.57 = 2983.00 vehicles per hour. Therefore, the keyed value is the only option consistent with the governing relationship. Signalized capacity scales the ideal discharge rate by the share of cycle effectively available. The distractors reflect use of displayed rather than effective green, omission of startup time,.

68. B — Using the stated data, timing is 7 + 184/3.5 = 59.57 seconds. Therefore, the keyed value is the only option consistent with the governing relationship. Total timing combines the initial interval with the time needed to traverse the crossing distance. The distractors reflect use of displayed rather than effective green, omission of startup time, or division where proportional capacity requires.

69. C — Using the stated data, cycle lost time is 4 x 9.80 = 39.20 seconds. Therefore, the keyed value is the only option consistent with the governing relationship. Total cycle lost time accumulates the startup and clearance losses associated with each phase. The distractors reflect use of displayed rather than effective green, omission of startup time, or division where proportional capacity.

70. D — Using the stated data, effective green ratio is (96-4)/410 = 0.22. Therefore, the keyed value is the only option consistent with the governing relationship. Only effective green, after subtracting lost time, contributes to the usable fraction of the cycle. The distractors reflect use of displayed rather than effective green, omission of startup time, or division where proportional capacity requires multiplication.

71. B — Using the stated data, capacity is saturation flow times green ratio: 1900 x 1.65 = 3135.00 vehicles per hour. Therefore, the keyed value is the only option consistent with the governing relationship. Signalized capacity scales the ideal discharge rate by the share of cycle effectively available. The distractors reflect use of displayed rather than effective green, omission of startup time,.

72. A — Using the stated data, timing is 7 + 192/3.5 = 61.86 seconds. Therefore, the keyed value is the only option consistent with the governing relationship. Total timing combines the initial interval with the time needed to traverse the crossing distance. The distractors reflect use of displayed rather than effective green, omission of startup time, or division where proportional capacity requires.

73. C — Using the stated data, L = 12(35)^2/60 = 245.00 feet. Therefore, the keyed value is the only option consistent with the governing relationship. The stated low-speed taper relation makes length proportional to offset and to the square of speed. The alternatives commonly omit a gap, count devices instead of spaces, misuse the speed conversion, or fail to square speed in.

74. D — Using the stated data, there are 69 spaces, so distance is 69 x 690 = 47610.00 feet. Therefore, the keyed value is the only option consistent with the governing relationship. The number of intervals between objects is one less than the number of objects. The alternatives commonly omit a gap, count devices instead of spaces, misuse the speed conversion, or.

75. A — Using the stated data, cycle length is 10+30 = 40 feet, so count is 4300/40 = 107.50. Therefore, the keyed value is the only option consistent with the governing relationship. Both the marked stripe and following gap occupy longitudinal distance in each repeating cycle. The alternatives commonly omit a gap, count devices instead of spaces, misuse the speed conversion, or.

76. B — Using the stated data, distance is 108 x 1.4667 x 8 = 1267.20 feet. Therefore, the keyed value is the only option consistent with the governing relationship. Preview distance follows from converting operating speed to feet per second and multiplying by available time. The alternatives commonly omit a gap, count devices instead of spaces, misuse the speed conversion, or fail.

77. D — Using the stated data, L = 12(55)^2/60 = 605.00 feet. Therefore, the keyed value is the only option consistent with the governing relationship. The stated low-speed taper relation makes length proportional to offset and to the square of speed. The alternatives commonly omit a gap, count devices instead of spaces, misuse the speed conversion, or fail to square speed in.

78. B — Using the stated data, there are 73 spaces, so distance is 73 x 730 = 53290.00 feet. Therefore, the keyed value is the only option consistent with the governing relationship. The number of intervals between objects is one less than the number of objects. The alternatives commonly omit a gap, count devices instead of spaces, misuse the speed conversion, or.

79. C — Using the stated data, cycle length is 10+30 = 40 feet, so count is 4500/40 = 112.50. Therefore, the keyed value is the only option consistent with the governing relationship. Both the marked stripe and following gap occupy longitudinal distance in each repeating cycle. The alternatives commonly omit a gap, count devices instead of spaces, misuse the speed conversion, or.

80. A — Using the stated data, dry unit weight is 245.00/(1+0.380) = 177.54 pcf. Therefore, the keyed value is the only option consistent with the governing relationship. Moist unit weight includes water mass, so dividing by one plus decimal water content isolates dry solids. The distractors result from reversing density ratios, confusing void ratio with porosity, treating percent as decimal, or dividing.

81. C — Using the stated data, relative compaction is 100(240.00/246.00) = 97.56%. Therefore, the keyed value is the only option consistent with the governing relationship. Relative compaction compares achieved field density directly with the specified laboratory maximum. The distractors result from reversing density ratios, confusing void ratio with porosity, treating percent as decimal, or dividing by the equivalency factor.

82. A — Using the stated data, void ratio is void volume divided by solids volume: 1.66/1.20 = 1.38. Therefore, the keyed value is the only option consistent with the governing relationship. Void ratio uses solids volume in the denominator, unlike porosity, which uses total volume. The distractors result from reversing density ratios, confusing void ratio with porosity, treating percent as decimal, or.

83. D — Using the stated data, daily loading is 2160 x 4.95 = 10692.00 ESAL. Therefore, the keyed value is the only option consistent with the governing relationship. Equivalent axle loading converts mixed truck repetitions into a common pavement-damage measure. The distractors result from reversing density ratios, confusing void ratio with porosity, treating percent as decimal, or dividing by the equivalency factor.

84. B — Using the stated data, dry unit weight is 253.00/(1+0.400) = 180.71 pcf. Therefore, the keyed value is the only option consistent with the governing relationship. Moist unit weight includes water mass, so dividing by one plus decimal water content isolates dry solids. The distractors result from reversing density ratios, confusing void ratio with porosity, treating percent as decimal, or dividing.

85. B — Using the stated data, relative compaction is 100(248.00/254.00) = 97.64%. Therefore, the keyed value is the only option consistent with the governing relationship. Relative compaction compares achieved field density directly with the specified laboratory maximum. The distractors result from reversing density ratios, confusing void ratio with porosity, treating percent as decimal, or dividing by the equivalency factor.

86. D — Using the stated data, void ratio is void volume divided by solids volume: 1.74/1.24 = 1.40. Therefore, the keyed value is the only option consistent with the governing relationship. Void ratio uses solids volume in the denominator, unlike porosity, which uses total volume. The distractors result from reversing density ratios, confusing void ratio with porosity, treating percent as decimal, or.

87. A — Using the stated data, daily loading is 2240 x 5.15 = 11536.00 ESAL. Therefore, the keyed value is the only option consistent with the governing relationship. Equivalent axle loading converts mixed truck repetitions into a common pavement-damage measure. The distractors result from reversing density ratios, confusing void ratio with porosity, treating percent as decimal, or dividing by the equivalency factor.

88. C — Using the stated data, dry unit weight is 261.00/(1+0.420) = 183.80 pcf. Therefore, the keyed value is the only option consistent with the governing relationship. Moist unit weight includes water mass, so dividing by one plus decimal water content isolates dry solids. The distractors result from reversing density ratios, confusing void ratio with porosity, treating percent as decimal, or dividing.

89. D — Using the stated data, Q = 1.25 x 9.20 x 78 = 897.00 cubic feet per second. Therefore, the keyed value is the only option consistent with the governing relationship. With the customary rational-method convention, the product yields the design peak discharge for the contributing area. The distractors reflect radius-diameter confusion, inverted continuity, omitted runoff factors, or use of perimeter.

90. B — Using the stated data, area is pi(8.60)^2/4 = 58.09 square feet. Therefore, the keyed value is the only option consistent with the governing relationship. Circular area depends on the square of diameter, with the four arising from conversion between radius and diameter. The distractors reflect radius-diameter confusion, inverted continuity, omitted runoff factors, or use of perimeter instead of cross-sectional area.

91. A — Using the stated data, continuity gives velocity Q/A = 172.00/18.40 = 9.35 feet per second. Therefore, the keyed value is the only option consistent with the governing relationship. Mean velocity follows directly from discharge divided by the wetted flow area. The distractors reflect radius-diameter confusion, inverted continuity, omitted runoff factors, or use of perimeter instead of cross-sectional area.

92. C — Using the stated data, rectangular flow area is 71 x 7.80 = 553.80 square feet. Therefore, the keyed value is the only option consistent with the governing relationship. Under the stated simplification, flow area is the product of bottom width and water depth. The distractors reflect radius-diameter confusion, inverted continuity, omitted runoff factors, or use of perimeter instead of cross-sectional.

93. B — Using the stated data, Q = 1.29 x 9.60 x 82 = 1015.49 cubic feet per second. Therefore, the keyed value is the only option consistent with the governing relationship. With the customary rational-method convention, the product yields the design peak discharge for the contributing area. The distractors reflect radius-diameter confusion, inverted continuity, omitted runoff factors, or use of perimeter.

94. C — Using the stated data, area is pi(9.00)^2/4 = 63.62 square feet. Therefore, the keyed value is the only option consistent with the governing relationship. Circular area depends on the square of diameter, with the four arising from conversion between radius and diameter. The distractors reflect radius-diameter confusion, inverted continuity, omitted runoff factors, or use of perimeter instead of cross-sectional area.

95. D — Using the stated data, continuity gives velocity Q/A = 180.00/19.20 = 9.37 feet per second. Therefore, the keyed value is the only option consistent with the governing relationship. Mean velocity follows directly from discharge divided by the wetted flow area. The distractors reflect radius-diameter confusion, inverted continuity, omitted runoff factors, or use of perimeter instead of cross-sectional area.

96. A — Using the stated data, rectangular flow area is 75 x 8.20 = 615.00 square feet. Therefore, the keyed value is the only option consistent with the governing relationship. Under the stated simplification, flow area is the product of bottom width and water depth. The distractors reflect radius-diameter confusion, inverted continuity, omitted runoff factors, or use of perimeter instead of cross-sectional.

97. C — Using the stated data, Q = 1.33 x 10.00 x 86 = 1143.80 cubic feet per second. Therefore, the keyed value is the only option consistent with the governing relationship. With the customary rational-method convention, the product yields the design peak discharge for the contributing area. The distractors reflect radius-diameter confusion, inverted continuity, omitted runoff factors, or use of perimeter.

98. A — Using the stated data, area is pi(9.40)^2/4 = 69.40 square feet. Therefore, the keyed value is the only option consistent with the governing relationship. Circular area depends on the square of diameter, with the four arising from conversion between radius and diameter. The distractors reflect radius-diameter confusion, inverted continuity, omitted runoff factors, or use of perimeter instead of cross-sectional area.

99. D — Using the stated data, continuity gives velocity Q/A = 188.00/20.00 = 9.40 feet per second. Therefore, the keyed value is the only option consistent with the governing relationship. Mean velocity follows directly from discharge divided by the wetted flow area. The distractors reflect radius-diameter confusion, inverted continuity, omitted runoff factors, or use of perimeter instead of cross-sectional area.

100. B — Using the stated data, rectangular flow area is 79 x 8.60 = 679.40 square feet. Therefore, the keyed value is the only option consistent with the governing relationship. Under the stated simplification, flow area is the product of bottom width and water depth. The distractors reflect radius-diameter confusion, inverted continuity, omitted runoff factors, or use of perimeter instead of cross-sectional.